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U. S. Government RESEARCH REPORTS

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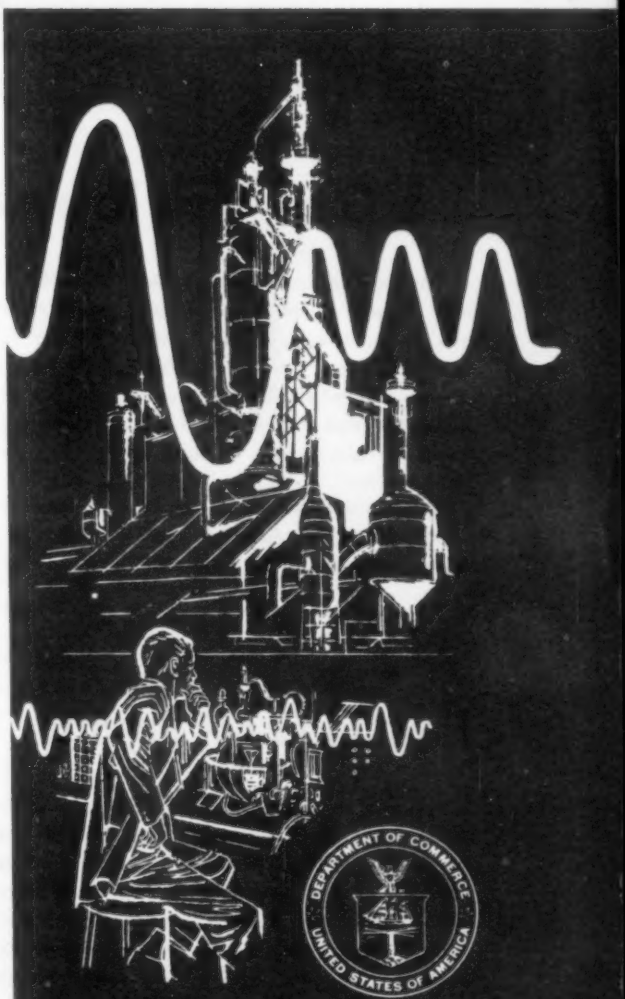

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION
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CONTENTS

Div.		Page
	INTRODUCTION	ii
1	AIRCRAFT AND FLIGHT EQUIPMENT	1
2	ASTRONOMY, GEOPHYSICS, AND GEOGRAPHY	4
3	CHEMICAL WARFARE EQUIPMENT AND MATERIALS	10
4	CHEMISTRY	10
5	COMMUNICATIONS	14
6	DETECTION	16
7	ELECTRICAL EQUIPMENT	17
8	ELECTRONICS AND ELECTRONIC EQUIPMENT	22
9	FLUID MECHANICS	38
10	FUELS AND COMBUSTION	45
11	GROUND TRANSPORTATION EQUIPMENT	47
12	GUIDED MISSILES	47
13	INSTALLATIONS AND CONSTRUCTION	49
14	MATERIALS (NON-METALLIC)	51
15	MATHEMATICS	56
16	MEDICAL SCIENCES	60
17	METALLURGY	67
18	MILITARY SCIENCES AND OPERATIONS	73
19	NAVIGATION	74
20	NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY	75
21	NUCLEAR PROPULSION	79
22	ORDNANCE	79
23	PERSONNEL AND TRAINING	82
24	PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES	83
25	PHYSICS	84
26	PRODUCTION AND MANAGEMENT	106
27	PROPULSION SYSTEMS	109
28	PSYCHOLOGY AND HUMAN ENGINEERING	112
29	QUARTERMASTER EQUIPMENT AND SUPPLIES	115
30	RESEARCH AND RESEARCH EQUIPMENT	116
31	SHIPS AND MARINE EQUIPMENT	120
32	MISCELLANEOUS ARTS AND SCIENCES	120
33	TRANSPORTATION	121
	AD INDEX	I-1

CONTENTS (CON.)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

	Page
BIBLIOGRAPHY	S-1
ASTRONOMY	S-1
BEHAVIORAL SCIENCES	S-1
BIOLOGICAL SCIENCES	S-3
CHEMISTRY	S-4
EARTH SCIENCES	S-6
ENGINEERING	S-7
FOOD, HANDLING, AND PACKAGING EQUIPMENT	S-23
MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT	S-23
MATERIALS	S-24
MATHEMATICS	S-26
MECHANICS	S-27
METALLURGY	S-29
NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY	S-32
PHYSICS	S-41
RESEARCH METHODS, TECHNIQUES AND EQUIPMENT	S-49
NUMBER INDEX	S-53

This issue includes:

TAB 61 - 4 - 3
AD 261500 - 262299

TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-261 500 Div. 1
(21 Aug 61) OTS price $3.60

Bioastronautics Div., Air Force Proving Ground Command, Eglin Air Force Base, Fla.
B-58 FLIGHT LINE AND MAINTENANCE HANGAR NOISE SURVEY (CARSWELL AFB, TEXAS),
by Sherrill G. Laney. July 61, 32p. incl. illus. tables.
(Proj. 102AH2)
(APGC TN 61-27) Unclassified report

DESCRIPTORS: *Airplane noise, *Airplane engine noise, *Jet engine noise, Measurement, Human engineering, Hangars, *Jet bombers, Maintenance, Hazards, Ear protectors, Effectiveness, Control, Test equipment.

One hundred and twenty noise level measurements of the four standard octave bands in the 300 to 4800 cps range were made in 30 locations in the maintenance environment of the B-58 weapon system. Both hangar and flight line locations were included. The sound pressure levels of all the flight line locations were in the range where ear protective devices are recommended. The sound pressure levels at 82% of the hangar locations were in the range for which protective devices are strongly recommended. Observations of maintenance activities revealed that maintenance personnel were not consistent in the use of protective devices in high noise areas. Recommendations are made toward lessening the potentials for ear damage due to high noise hazards. (Author)

AD-261 567 Div. 1, 25
(21 Aug 61) OTS price $6.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
EVALUATION OF ARMY FREE FALL PARACHUTE ASSEMBLY TYPE A/P28S-3,
by Mitchell B. Kanowski. Aug 61, 61p. incl. illus. tables (AFFTC TR 61-37)
Unclassified report

DESCRIPTORS: *Parachute descents, Free fall models, Military equipment, Aircraft equipment, Design, Effectiveness, Reliability, *Parachutes, Helmets, Goggles, Oxygen masks, Pyrotechnic pistols.

Tests were conducted for the U. S. Army to determine the reliability of an interim parachute assembly, designated Type A-P28S-3, and the suitability of associated equipment. The main parachute has a 35-foot nominal diameter MC-1 canopy, modified with a 14.48 sq. ft. single orifice, and an automatic ripcord release. One-hundred fifty-three tests were made with dummies at indicated airspeeds ranging from near 0 to 400 knots. Drop altitudes ranged from 500 feet above the ground to a pressure altitude of 5,000 feet. One-hundred ninety-seven live jump tests were made at indicated airspeeds ranging from 65 to 170 knots at pressure altitudes of 5,000 to 25,000 feet. Each parachutist carried a front type equipment container having a loaded weight of approximately 40 pounds which was attached to the harness D-rings. The parachutists were able to achieve body stability in a prone position. The parachute assembly and associated equipment were satisfactory. (Author)

AD-261 692 Div. 1
(22 Aug 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
TEST AND EVALUATION OF THE E-33 SPRAY TANK AS A DISSEMINATOR OF SMOKE FROM HIGH-SPEED AIRCRAFT,
by David F. Johanson. 4 Aug 61, 32p. incl. illus. tables (NOTS TP 2733)
Unclassified report

DESCRIPTORS: *Spray tanks, *Smoke screens, *Smoke generators, Hazards, Personnel, Design, Airborne, Aircraft chemical tanks, Jet planes, Effectiveness, Jettisonable equipment, Tests.

This report summarizes the test and evaluation of the E-33 Spray Tank to determine its suitability for service use as a disseminator of FS smoke agent from jet aircraft. The information will aid in establishing procedures and in determining safety requirements for the general operation of the E-33 Spray Tank System. (Author)

AD-261 746 Div. 1, 33
(23 Aug 61) OTS price $2.60

4750th Test Squadron (Tactics and Application Engineering), Tyndall Air Force Base, Fla.
FIRST ARTICLE FUNCTIONAL TEST OF THE BAK-9/F48A AIRCRAFT ARRESTING BARRIER.
Final rept.,
by George C. Cannon, Jr. 10 July 61, 21p. incl. illus. (Proj. ADC/73AD/61-5)
Unclassified report

DESCRIPTORS: *Arresting gear, Airplane landings, *Jet planes, Jet fighters, Fighters, Landing, *Landing aids, Tests.

The BAK-9/F48A aircraft arresting barrier is a rotary friction brake type energy absorber. The distressed aircraft's tailhook engages a runway pendant cable which pulls two nylon tapes from storage reels mounted on a common shaft between two disc type brakes. The reels revolve and drive a hydraulic pump which supplies pressure to a control unit. The control unit applies constantly varying pressure to the reel brakes so as to stop the aircraft in 1000 ft regardless of engaging speed. An electric motor retrieves the system in 3 1/2 min. The system will stop a 45,000 lb aircraft at 161 kn or a 55,000 lb aircraft at 141 kn without exceeding 2.0 G deceleration or conservative tape strengths. Fifteen F-106A and two F-101B arrestments were made at speeds of 52 to 106 kn and aircraft weights of 28,500 to 43,500 lbs. The system was tested at

ambient, +120 F and -30 F temperatures. On-centerline and 75 ft off-center engagements were made. A barrier intercoupling disconnect feature was tested. The system performed very satisfactorily under these conditions. (Author)

AD-261 786 Div. 1, 16
(22 Aug 61) OTS price $16.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MAN IN INTERPLANETARY SPACE - A SMALL MODERN ENCYCLOPEDIA (Clovek V Meziplanetarnim Prostoru)
by Josef Dvorak, Peter Kuzmic Isakov, and Jan Hospodar. 239p. incl. illus. tables (Trans. no. MCL-907 of Ceskoslovenska Spolecnost Pro Sireni Politickych A Vedeckych Znalosti, Prague, pp.1-160, 169-211, 1960)
Unclassified report

DESCRIPTORS: *Space flight, Man, USSR, Satellites, *Space medicine, Radiation effects, Physiology, Psychology.

AD-261 816 Div. 1
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON ONE METHOD OF SELECTING THE PARAMETERS OF THE DAMPERS OF ANGULAR MOTIONS OF AN AIRCRAFT,
by N. P. Kolpakova and S. I. Rybnikov.
26 July 61, 5p. incl. illus. (Trans. no. MCL-1099 of Izvestiya Vysshykh Uchebnykh Zavedeniy, Aviatsionnaya Tekhnika 3:107-109, 1960)
Unclassified report

DESCRIPTORS: *Airplanes, *Control systems, *Servo systems, Mathematical analysis, Design, Damping, *USSR, Technological intelligence, Functions.

AD-261 824 Div. 1
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MIRACLE OF THE TWENTIETH CENTURY,
by I. Pokrovskiy. 27 July 61, 4p. (Trans. no. MCL-1150 of Ekonomicheskaya Gazeta 88 (941), p. 4, 13 Apr 61)
Unclassified report

DESCRIPTORS: *Space flight, USSR, Space probes.

AD-261 913 Div. 1, 2, 4, 26
(28 Aug 61) OTS price $6.60

Metal Hydrides, Inc., Beverly, Mass.
HYDROGEN GENERATION FOR HIGH ALTITUDE BALLOONS.
Final rept., 15 June 60-14 June 61.
14 June 61, 65p. incl. illus. tables (Rept. no. 4)
(Contract DA 36-039-sc-84931, Proj. 3D36-03-001-01)
Unclassified report

DESCRIPTORS: *Gas generating systems, Sodium compounds, Borohydrides, Calcium compounds, Aluminum compounds, Lithium compounds, *Hydrides, *Hydrogen, Catalysts, Catalysis, Cobalt compounds, Chlorides, Production, *Balloons, *Meteorological balloons, High altitude, Pellets, Chemical reactions, Tests, Stability, Storage, Foams.

Based on efficiency, weight, volume, and cost per charge, CaH2, pelleted NaAlH4, and NaBH4 were the most promising materials for the development of a H generating charge. LiAlH4 was substituted for NaAlH4 for large-scale testing. CaH2 and pelleted LiAlH4 were scaled up to give 42 cu ft of H smoothly and efficiently within 30 min, using the standard ML-303/TM generator. Manifolds of 4 and 6 charge cans of each of these materials were tested successfully to generate 168 and 252 cu ft of H. Accelerated aging tests indicated a questionable shelf life for LiAlH4. Because it is water-soluble, NaBH4 required an enclosed generator. Efficient generation from NaBH4 required a catalyst, preferably CoCl2. The foaming which accompanied generation was controlled by addition of a small amount of gum turpentine. As the turpentine sometimes decelerates the reaction, amines or alcohols were used to accelerate the generation rate. (Author)

AD-261 954 Div. 1
(28 Aug 61) OTS price $4.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
EVALUATION OF ARMY PARACHUTE, PERSONNEL, TYPE AP/28S-3,
by Charles O. Laine. Aug 61, 43p. incl. illus. (Addendum 2 to AFFTC TR 61-37, AD-261 567)
Unclassified report

DESCRIPTORS: *Parachutes, Test equipment, Tests, Aviation personnel, Packs, Containers, *Parachute jumping, Parachute descents, Aircraft, Oxygen equipment, Effectiveness.

This addendum presents the recommended procedures and techniques for using the Army Free-Fall Parachute Assembly, A/P28S-3 in conjunction with C-130, C-119, C-123, C-54, C-47, SA-16, and U-1A (Army) aircraft. (Author)

AD-261 961 Div. 1
(29 Aug 61) OTS price $9.10

Flight Safety Foundation, Inc., Phoenix, Ariz.
U. S. ARMY H-25 HELICOPTER DROP TEST,
by James W. Turnbow. 15 Mar 61, 99p. incl. illus. table (Rept. no. AvCIR 2-TR-125)
(Contract DA 44-177-tc-624)
(TREC TR 60-76) Unclassified report

DESCRIPTORS: Helicopters, Accidents, Safety devices, *Aviation accidents, Aviation personnel, Safety, Safety belts, Safety harness, Flight testing, Test methods, Test equipment.

This report presents the results of an exploratory, experimental study. A Piasecki Model H-25A helicopter has been employed in recreating a typical accident approximating an unsuccessful attempt to attain auto-rotation from a low altitude power failure. Relatively high (50G to 100G) vertical and longitudinal accelerations have been observed for periods in the order of 10 milliseconds in an impact leaving the cabin area of the airframe reasonably intact. Failure of all seats occurred without failure of either seat belts or shoulder harness. The instrumentation and research techniques used in (1) the

measurement of the impact forces and accelerations, (2) the determination of the feasibility of the utilization of on-board recorders, and (3) the evaluation of certain problems inherent in the dynamic crash testing of full-scale helicopter and VTOL aircraft were presented in an earlier preliminary report (AvCIR-1-TR 124). (Author)

AD-261 977 Div. 1, 12, 28
(29 Aug 61) OTS price $1.75

Chance Vought Aircraft, Inc., Dallas, Tex.
FEASIBILITY STUDY TO DETERMINE PRACTICABILITY OF PROVIDING MOCKUP IMPROVEMENTS.
Rept. for Feb 60-June 60 on Crew Station Design for Flight Vehicles,
by W. F. Lowe, C. C. Calvin, and L. E. Doughty.
July 60, 60p. incl. illus. tables, 10 refs.
(Contract AF 33(616)7019, Proj. 1425)
(WADD TR 60-579) Unclassified report

DESCRIPTORS: *Airplanes, *Jet fighters, Test methods, *Satellite vehicles, *Hypervelocity vehicles, *Re-entry vehicles, *Flight instruments, Display systems, Design, Simulation, Human engineering, Servo systems, Programming, Analog computers, Digital computers, Manned, Space flight, Control panels, Noise generators, Instrument panels.

This investigation included a survey of manned flight vehicles of the period 1960 to 1970. Display requirements were tabulated and display programming methods were evaluated. A study was made of mechanisms and methods for providing an economical, reliable, and flexible system of dynamic mockup displays which would allow realistic evaluation of a crew station and its related equipment by engineering, design, and flying personnel. The use of pre-recorded magnetic tape is recommended for the most effective display programming at lowest cost. An inexpensive servo drive mechanism with synchro output is considered to be most applicable as a universal drive. (Author)

AD-262 058 Div. 1, 2
(28 Aug 61) OTS price $3.60

Aeronautical Structures Lab., Naval Air Material Center, Philadelphia, Pa.
LOW ALTITUDE GUST DATA OBTAINED IN FLEET AIRCRAFT,
by Erwin P. Roeser. 21 July 61, 1v. incl. illus. tables (NAMATCEN ASL 1041)
Unclassified report

DESCRIPTORS: *Aircraft, *Load distribution, Naval aircraft, *Gusts, *Turbulence, Aerodynamics, Low altitude bombing, Statistical analysis, Wind, Meteorology, *Attack bombers.

A statistical analysis is presented of gust environment based upon recorded experience of fleet aircraft on routine, low-altitude training flights. Discrete gust data are also presented as probability density distributions of the root-mean-square gust velocity. On the basis of data gathered to date, correlation of atmospheric turbulence with topography and meteorological data has been limited to comparing flights over two geographical areas. Definite gust-environment patterns are evident. Cold, winter days with unlimited ceiling, permitting maximum solar radiation, appear to produce intense turbulence on the cross-country flights in the southeastern United States. Low-altitude gust intensity and frequency is a function of ambient temperature over flat desert terrain on days of unlimited ceiling and 15-mile visibility. (Author)

AD-262 170 Div. 1, 12
(30 Aug 61) OTS price $2.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THE USE OF DIGITAL TECHNIQUES FOR FLIGHT CONTROL,
by J. N. Ball. 1 June 61, 20p. (Rept. no. CAL-108)
Unclassified report

A discussion prepared for SAE Committee A-18 on Aerospace Vehicle Flight Control Systems.

DESCRIPTORS: Airplanes, Guided missiles, Spaceships, Satellite vehicles, Hypervelocity vehicles, *Control systems, *Servo systems, *Digital systems, Feasibility studies, Analog to digital converters, Design, *Digital computers.

The usefulness of digital techniques in the flight control systems of aircraft, missiles, and space vehicles is considered. The discussion is in terms of basic attitude control loops, and does not extend to outer loops used for guidance or navigation. It is pointed out that there are various techniques and types of equipment to which the word digital is applied. The discussion then considers in turn the various forms of input command and their influence, sensors, analog-digital and digital-analog converters, computers and computing methods for the attitude control task, and actuating devices for producing control moments. The choices between analog and digital methods are engineering decisions to be made in the light of various design requirements for each specific case. The problem of conversion between analog and digital information appears as a key point. For proper attitude control in the presence of structural vibrations, a high sampling and computing rate is necessary. Digital techniques provide accuracy, freedom from drift, insensitivity to stray noise, and adaptability to automatic checkout. They are well suited to implementation of nonlinear and adaptive control systems. (Author)

AD-262 200 Div. 1
(30 Aug 61) OTS price $19.75

Vertol Div., Boeing Airplane Co., Morton, Pa.
HIGH PERFORMANCE TANDEM HELICOPTER STUDY. VOLUME 2. DESIGN ANALYSIS.
Apr 61, 321p. incl. illus. 21 refs.
(Contract DA 44-177-tc-686)
(TREC TR 61-43) Unclassified report

DESCRIPTORS: *Helicopters, Design, Rotor blades, Transport planes, *Helicopter rotors, Wind tunnel models, Tests, Control systems, Flight speeds, Aerodynamics, Aerodynamic data, Fuselages, Model tests.

A preliminary design study was conducted to establish a tandem helicopter configuration capable of the following minimum performance: (1) 1600 nautical miles ferry range at zero headwind with 1 hour fuel reserve, (2) 200 miles per hour speed with a minimum payload of 800 pounds, and (3) flying qualities to meet MIL-H-8501. Detailed aerodynamic and design layout studies are presented for the high performance 107-II. The major design areas covered are rotor blades, hub, and controls; mechanical instability, drive system, fuselage changes, flight controls, and weight. Both performance and flying qualities are thoroughly investigated. Over-all feasibility of a high performance helicopter is assured. Studies of an advanced 107 and advanced YHC-1B (Chinook) indicate that operational high performance helicopters are obtained if the ratio of payload to empty weight is maintained in going to the high performance configuration. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-261 529 Div. 2
(21 Aug 61) OTS price $7.60

Harvard Coll. Observatory, Cambridge, Mass.
AREOGRAPHIC COORDINATES FOR 1958,
by Gerard de Vaucouleurs. Aug 61, 71p. incl. illus. tables (Scientific rept. no. 4)
(Contracts AF 19(604)7461 and AF 19(604)3074)
(AFCRL-818) Unclassified report

DESCRIPTORS: *Mars, Surface properties, Mapping, *Geodetic astronomy, Extraterrestrial geography, Corrections, Tables, Geodetic data.

Areographic coordinates of 546 points of the surface of Mars derived from 2321 measurements on 32 drawings made in October and November 1958 are listed. Longitudes are corrected for phase effect. Probable errors are of the order of 1 degree or 60 km on Mars. Comparisons are made with longitudes derived from transit observations in 1939, 1941, and 1958. Reduction constants to a system of absolute longitudes are given. (Author)

AD-261 533 Div. 2
(21 Aug 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
LOS TERREMOTOS DE MAYO-CHILE 1960,
by Pierre Saint-Amand. Aug 61, 39p. incl. illus. 32 refs. (NOTS TP 2701)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: *Earthquakes, Chile, Geophysics, Seismic waves, Floods, Volcanoes, Geology.

This article presents an eyewitness account of the Chilean earthquakes of 1960. The earthquakes and the subsequent seismic sea waves are discussed as to their origin, location, severity, and damage. Color maps show locations of magnitudes and geological structure and locations of fault zones. (Author)

AD-261 565 Div. 2
(21 Aug 61) OTS price $16.50

Air Force Cambridge Research Labs., Bedford, Mass.
ANNUAL REPORT 1960.
Rept. for 1 Mar 59-30 June 60.
30 June 60, 250p. incl. illus. tables (AFCRL-637)
Unclassified report

DESCRIPTORS: *Geophysics, *Research program administration, Atmosphere, *Meteorology, Meteorological balloons, *Ionosphere, Space flight, *Solar observatories, Solar spectrum, Thermal radiation.

Contents:
Research programs
Terrestrial sciences laboratory
Aerophysics laboratory
Atmospheric circulations laboratory
Meteorological development laboratory
Balloon development laboratory
Thermal radiation laboratory
Photochemistry laboratory
Ionospheric physics laboratory
Space flight physics laboratory
Sacramento Peak Observatory

AD-261 584 Div. 2
(21 Aug 61) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
AREA-DOSAGE RELATIONSHIPS AND TIME OF TRACER ARRIVAL IN THE GREEN GLOW PROGRAM,
by William P. Elliott, R. J. Engelmann, and Paul W. Nickola. May 61, 36p. incl. illus. tables. (Air Force Surveys in Geophysics no. 134; AFCRL-468)
(In Cooperation with Hanford Atomic Products Operation, Richland, Wash.)
Unclassified report

DESCRIPTORS: *Geophysics, Meteorology, Meteorological data, Diffusion, *Wind direction indicators, Wind, Tracer studies, Mathematical prediction, Dosage, Zinc pigments, Measurement.

An empirical relationship between the area in which a given dosage is equalled or exceeded and the value of the dosage itself are developed using Green Glow data. It is found that the logarithm of the area is nearly a linear function of the logarithm of the dosage divided by the source strength and multiplied by a representative wind speed. These results differ only slightly from similar results obtained from Prairie Grass data. Observations of the time of first arrival of the tracer near ground level at distances of 8 and 16 miles from the source indicate that the tracer material which first arrives has travelled with a wind speed greater than the surface wind (about 15 ft). It would be necessary to have wind speed measurements between 50 and 100 ft above ground in order to estimate the time of first arrival at these distances even though the source is no higher than 15 ft. (Author)

AD-261 704 Div. 2, 6
(22 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
RADAR OBSERVATIONS OF METEORS ACCORDING TO THE INTERNATIONAL GEOPHYSICAL YEAR PROGRAM (Radiolokatsionnyye nablyudeniya meteorov po programme Mezhdunarodnovo geofizicheskovo goda),
by B. L. Kashcheyev. Aug 61, 20p. incl. illus. (Technical trans. no. F-68; Trans. from V Section of the IGY Program (Investigation of Ionosphere and Meteors) no. 2, pp. 40-53, 1960)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical trans. F-68.

DESCRIPTORS: *Meteors, High altitude, Radar receivers, *Ionosphere, Velocity, Determination, Radio astronomy, Radar signals, Radar interference, Radar echo areas, Reflection, High frequency, *Radar tracking, Atmosphere, Diffusion.

An apparatus used in the investigation of meteor activity, which employs a system of protection against pulse interference, is described. Preliminary results of the measurement of meteor velocities obtained by Russian observation stations during the first 12 months of the International Geophysical Year are presented, and a study of the physical properties of the atmosphere at altitudes of 80 to 100 kilometers is made. (Author)

AD-261 705 Div. 2
(23 Aug 61) OTS price $5.60

Kaman Nuclear, Colorado Springs, Colo.
THE SIZE OF HEIGHT SYSTEMS ON AN ISOBARIC SURFACE,
by C. E. Buell. July 61, 50p. incl. illus. tables (Rept. no. KN-61-16(R); Scientific rept. no. 1)
(Contract AF 19(604)7282, Proj. P-8624)
(AFCRL-404) Unclassified report

DESCRIPTORS: *Barometric pressure, Northern hemisphere, Periodic variations, *Wind, Height finding, Meteorological charts, Corrections, Tables, Statistical analysis.

The size parameter for height systems on isobaric surfaces for summer and winter at the 500- and 300-mb levels is illustrated by maps covering the northern hemisphere (exclusive of the tropical regions). The derivation of this quantity and it's connection with the standard deviation of height and the vector standard deviation of wind on isobaric surfaces are discussed briefly. (Author)

AD-261 706 Div. 2
(23 Aug 61) OTS price $3.60

Kiruna Geophysical Observatory (Sweden).
THE GREAT EARTH STORMS IN NOVEMBER 1960 AS OBSERVED AT KIRUNA GEOPHYSICAL OBSERVATORY,
by Johannes Ortner, Alv Egeland and Bengt Hultqvist. 7 Feb 61, 35p. incl. illus. (Scientific rept. no. 1)
(Contract AF 61(052)418)
(AFCRL-562) Unclassified report

DESCRIPTORS: *Solar flares, *Ionospheric disturbances, *Magnetic storms, Terrestrial magnetism, Radio waves, High frequency, Cosmic ray telescopes, Ionospheric propagation, Absorption, Reflection, Recording devices, Very low frequency, Magnetometers, Sweden.

The great earth storms caused by the solar flares, which occurred during the period 10-20 November 1960, situated at the southern boundary of the auroral zone, are discussed. Possible physical connections between the various parameters recorded by means of a riometer, a VLF receiver, ionospheric sounder equipments, an oblique auroral reflection receiver, magnetometers and cosmic ray telescopes are discussed. Special attention is given to the following features: (1) the good correlation between disturbances of the geomagnetic field and ionospheric absorption of HF radio waves; (2) the world wide cosmic ray increases, the responsible solar proton energies and the extension of the polar cap; (3) unusual propagation conditions for VLF radio waves; (4) absence of auroral echoes at the time, when the strongest geomagnetic activity has been observed; and (5) observation of unusually low daytime reflection heights by means of a 3 Mc vertical ionospheric recorder. (Author)

AD-261 713 Div. 2, 6
(23 Aug 61) OTS price $9.10

New York U. Coll. of Engineering, N. Y.
WIND VARIABILITY IN THE MESOSPHERE AS DETERMINED BY THE TRACKING OF FALLING OBJECTS. AN EVALUATION AND PRELIMINARY RESULTS.
Final rept.,
by Alvan Bruch and Griffith M. Morgan, Jr.
May 61, 104p. incl. illus. tables, 30 refs.
(Contract AF 19(604)6193)
(AFCRL-660) Unclassified report

DESCRIPTORS: *Wind, *Radar tracking, *Periodic variations, Wind direction indicators, Upper atmosphere, Radar confusion reflectors, Parachutes, Harmonic analysis, Meteorology, Falling bodies, Radar targets.

Observations of winds in the mesosphere, obtained by radar tracking of targets, are analyzed to give monthly and seasonal mean values at various altitudes at each observation station, seasonal standard deviations of the mean, root-mean-square averages of wind change at a fixed point in selected time intervals, the first harmonic of the annual march of the east-west component, frequency distributions of vertical wind shears, and estimates of vertical velocities. The experimental design of the observations is discussed at length and error and bias are estimated. Although the mean values show consistency, the standard deviations show low statistical significance. Evidence is found casting some doubt on the accuracy of observations where chaff is the radar target. (Author)

AD-261 720 Div. 2
(22 Aug 61) OTS price $1.10

Oregon State U. School of Science, Corvallis.
RESEARCH ACTIVITIES.
Progress rept. no. 3, 1 Apr-30 June 61,
by June G. Pattullo. July 61, 6p. (Reference no. 61-5)
(Contract Nonr-128602, Proj. NR 083-102)
Unclassified report

DESCRIPTORS: *Oceanography, *Oceanographic data, Hydrographic surveying, Sedimentation, Salinity, Minerals, Marine biology, Scientific research, Oregon, Pacific Ocean.

Contents:
Hydrographic survey of Oregon coastal waters
Plankton inventories
Accessioning
Nekton studies
Water masses off the Oregon coast
Seasonal heat storage in the Pacific Ocean
Shipboard chemical analyses of sea water

AD-261 737 Div. 2, 8
(22 Aug 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
INTERFEROMETRY OF CENTAURUS A,
by R. N. Bracewell. 30 June 61, 14p. incl. illus. tables (Scientific rept. no. 16; Stanford Radio Astronomy Institute Publication no. 15)
(Contract AF 18(603)53)
(AFOSR-1602) Unclassified report

DESCRIPTORS: Solar noise, Extraterrestrial radio waves, Radio interference, Sky brightness, *Radio astronomy, *Galaxies, Visibility, Radio interferometers.

Fan beam observations with a beamwidth of 2.3 min have revealed two distinct components to the central concentration of Centaurus A. Earlier interferometric data had shown an equivalent elliptical distribution oriented with the major axis in position angle 130 degrees, and it seemed possible that the two-dimensional arrangement of the two components might be determined by the earlier data. The expected complex visibility has been calculated for different models that are compatible with the fan beam observations, and compared with interferometric data of Mills (Australian J. Phys. 6:452-470, 1952) and Twiss,

Carter and Little (The Observatory 80:153-159, 1960), and Moffet. The possible arrangements of the components have been narrowed down to two, each quite plausible on other grounds. The validity of interferometry for unraveling source distributions is confirmed, especially if a wise choice of spacings and azimuths is made. The calculated visibilities furnish a guide to future observations. (Author)

AD-261 769 Div. 2
(22 Aug 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE FORMATION AND THAWING OF ICE ON LAKES AND RESERVOIRS AND CALCULATION OF THE PERIODS OF ICING AND CLEARING (Obrazovaniye I Staivaniye L'Da Na Ozerakh-Vodokhranilishchaka I Raschet Srokov Ledostava I Ochishcheniya),
by V. V. Piotrovich. June 61, 316p. incl. tables, 33 refs. (Trans. no. MCL-187 of Gidrometeorologicheskoye Izdatel'stvo (Otdeleniye) Moscow, pp. 192, 1958)
Unclassified report

DESCRIPTORS: *Ice, Melting, Lakes, USSR, Measurement, Temperature.

AD-261 784 Div. 2
(22 Aug 61) OTS price $26.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE MOON (Luna),
by N. P. Barabashov, V. A. Bronshten and others. 23 May 61, 516p. incl. illus. tables (Trans. no. MCL-882 of Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury State Publishing House of Physics-Mathematical Literature, Moscow, 384p., 1960)
Unclassified report

DESCRIPTORS: *Moon, Surface properties, USSR, Motion, Rotation, Extraterrestrial geography, Physical properties, Radio astronomy, Astronomical data, Scientific research.

Contents:
The motion, rotation, and figure of the moon
Lunar cartography and selenographic coordinates
Description of the lunar surface
The problem of the atmosphere of the moon
The physical properties of the lunar surface
Studies of the moon by radio methods
Characteristic features of the relief of the moon
Basic problems of the genesis and sequence of development of lunar formations
The role of external cosmic factors in the evolution of the moon
The nature of the lunar surface

AD-261 787 Div. 2, 25
(22 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A STUDY OF THE SCATTERING INDICATRICES IN THE TROPOSPHERE AND LOWER STRATOSPHERE,
by V. F. Belov. 27 July 61, 21p. incl. illus. tables (Trans. no. MCL-929 of Tr Tsentr Aerol Observ, 23: pp. 63-77, 1957)
Unclassified report

DESCRIPTORS: *Atmosphere, *Stratosphere, *Particles, *Scattering, Density, Optics, Optical equipment, Photometers, Aerosols, USSR, Sky brightness, Determination.

AD-261 799 Div. 2, 24
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
OBSERVATIONS OF AN ARTIFICIAL COMET AT BYURAKAN,
by E. Ye. Khachikyan, A. T. Kalloglyan, and M. A. Kazaryan. 27 July 61, 5p. incl. tables. (Trans. no. MCL-978 of Astronomicheskiy Tsirkulyar 205:2-3, 15 Oct 1959)
Unclassified report

DESCRIPTORS: *Comets, *Photographic analysis, Simulation, Tests, USSR, Tables.

On 12 September 1959, at installation Comet A (two cameras, objective diameter 100 mm, f:500 and f:250), 28 frames were obtained showing an artificial comet (sodium cloud) ejected from the second Soviet cosmic rocket. Both cameras photographed simultaneously starting at 21h 35m 00s Moscow time. The times of the beginning and end of the exposures are given of the last five pairs of photographs. The photographs contained 6 images of the sodium cloud obtained with the f:250 camera and one with the f:500 camera. The first photograph, in the form of a bright star with a weak aureole, was obtained on frame No. 10 (both cameras). In subsequent photographs the cloud emerged in the form of an expanding ring with irregular brightness distribution. The maximum blackening density was observed in a direction close to that of the movement of the rocket. (Author)

AD-261 806 Div. 2
(22 Aug 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE DRIFT OF IONIZED GAS IN THE UPPER ATMOSPHERE (Dvizheniye Ionizirovannogo Gaza v Verkhney Atmosfere),
by V. P. Dokuchayev. 27 July 61, 67p. incl. illus. tables, 156 refs. (Trans. no. MCL-1036 of Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiofizika 4:5-39, 1961)
Unclassified report

DESCRIPTORS: *Gas ionization, Upper atmosphere, *Stratosphere, *Ionosphere, Exosphere, Drift, *Air mass analysis, Experimental data, Ionospheric disturbances, Electrons, Density.

Contents:
A system of electrodynamic equations for incompletely ionized gas
Winds in the upper atmosphere
The drift of plasma in the upper atmosphere
The drift of irregularities of electron concentration in the ionosphere
Regular drifts in the ionosphere
The origin of ionospheric irregularities
Irregularities in the E-region of the ionosphere
Irregularities in the F-region of the ionosphere
The hydrodynamic relationship between the ionosphere and the troposphere
The electrodynamic relationship between the ionosphere and the atmosphere (exosphere)

AD-261 834 Div. 2, 25
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NITROGEN IONS IN THE UPPER ATMOSPHERE AND

NOCTURNAL IONIZATION OF THE E REGION,
by V. G. Istomin. 27 July 61, 10p. incl. illus.
(Trans. no. MCL-1213 of Doklady Akademii Nauk SSSR, 137:1102-1105, 11 Apr 61)
Unclassified report

Presented by Academician Ye. K. Fedorov on December 26, 1960.

DESCRIPTORS: Upper atmosphere, *Ionosphere, *Ions, Nitrogen, Ionization, Mass number, Detection, Twilight, *Molecular spectroscopy, Mass spectrometers, Night sky, Measurement, Satellite vehicles.

AD-261 835 Div. 2
(24 Aug 61) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
THE USE OF THE THERMAL RELATIONSHIP IN FORECASTING SURFACE WINDS AT VERNALIS, CALIFORNIA,
by Delos P. Mentzer. 1960, 3p.
Unclassified report

DESCRIPTORS: *Weather forecasting, *Wind, Convection, Thermal radiation, Surface temperatures, Terrain, California, Measurement, Meteorological balloons, Launching.

AD-261 838 Div. 2, 24, 30
(24 Aug 61) OTS price $16.00

Autometric Corp., New York.
THREE DIMENSIONAL AREA MATCH TECHNIQUE FOR PHOTOGRAPHIC CONTROL EXTENSION STUDY.
Final technical rept.,
by Mendel Halberstam, Israel Pressman, and Robert Levine, Aug 61, 243p. incl. illus. tables, 26 refs. (Rept. no. 32-FR)
(Contract AF 30(602)2187)
(RADC TR 61-151) Unclassified report

DESCRIPTORS: *Aerial photography, *Mapping, *Three dimensional photography, Correlation techniques, Aerial reconnaissance, Photographic intelligence, Errors, *Data processing systems, Phototubes, Phosphors, Photographic film, Mathematical analysis, Statistical distributions, Programming, Digital computers.

A study of the feasibility and optimum design of an automatic analytical triangulation system was made. The investigation was concerned with two aspects: (1) automatic identification and measurement of conjugate image points; and (2) the required data processing to derive the orientation parameters from the measurement data. The expected measurement system performance was calculated as a function of the statistics of the photographic image and the image size. Errors due to various noise sources were also calculated. A data processing system which would minimize the sum of squares of intersection errors was formulated. (Author)

AD-261 842 Div. 2
(23 Aug 61) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
THE PREDICTION OF NOON VISIBILITY IN WINTER AT RAF STATION CHELVESTON,
by Robert A. DeLapp, June 61, 8p. incl. illus. tables.
Unclassified report

DESCRIPTORS: Weather forecasting, *Visibility, Great Britain.

This paper presents an objective aid for the forecasting of noontime visibility at Chelveston during the winter. Use of this forecasting aid will by no means solve all of the forecaster's problems, but it will support his predictions with the best available data and should consequently improve not only his accuracy but his confidence as well. From data available at 0700Z, forecast the occurrence of visibility less than one mile at 1200Z at Chelveston in winter is the problem under study. Previous studies have shown that the most reliable predictor in the United Kingdom is one which considers the measurement of the low level wind flow. It was decided to use the 0700Z surface wind speed (Knots) and direction (magnetic-36 points) at Chelveston to measure the low level flow. (Author)

AD-261 843 Div. 2
(23 Aug 61) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE AID FOR FORECASTING STRONG AND GUSTY SURFACE WINDS AT TRAVIS AFB, CALIFORNIA,
by Thomas H. Simmonds. Aug 61, 6p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Weather forecasting, *Wind, *Gusts, Terrain, Surface properties, Test methods, Meteorological data, Air force research, California, Statistical analysis.

AD-261 845 Div. 2
(23 Aug 61) OTS price $1.10

Army Map Service, Washington, D. C.
COMBINATION MAP COMPILATION. COLOR-SEPARATION METHODS,
by T. C. McKeown, Mar 61, 9p. (Technical rept. no. 33)
Unclassified report

DESCRIPTORS: *Mapping, *Colors, Separation, Preparation, Processing, Standards, Test methods.

This analysis covers the investigation and development of Combination Map Compilation - Color-Separation Methods as substitute time-saving procedures for conventional or standard map compilation and color-separation methods performed in separate phases. The original purposes of the investigation were, first, to find ways of eliminating the duplication inherent in the standard methods and, second, to adapt scribing techniques to compilation procedures. It developed, however, that these purposes could be accomplished simultaneously by the application of several unique techniques or methods which became apparent during the investigation and which are herein described. Combination Map Compilation - Color-Separation Methods not only are practical and time saving, but are eminently suited to quantity cartographic production. Training in these methods actually inspires more individual initiative on the job which, consequently, tends toward greater production. (Author)

AD-261 862 Div. 2, 24
(24 Aug 61) OTS price $10.10

Milan U. (Italy).
THEORY AND PRACTICE OF ANALYTICAL AEROTRIANGULATION,
by Giuseppe Inghilleri. May 59, 122p. incl.

illus. tables (Technical paper no. 2)
(Contract AF 61(052)94)
(RADC TN 61-171) Unclassified report

DESCRIPTORS: *Mapping, *Aerial photography, Photographic film, Distortion, Atmospheric refraction, Corrections, Numerical methods and procedures, Theory, Programming, Digital computers, Stereoscopic projectors.

Formulas used in a method of analytical aerial triangulation are presented. Formulas for the correction of the image co-ordinates are listed, and methods for correcting the film shrinkage, distortion and atmospheric refraction are discussed. The technical procedure to measure the image co-ordinates with a Stereocomparator T A 3 is wholly automatic, since the data punched by the T A 3 are directly introduced in the electronic computer that will give the Geodetical Co-ordinates of the points of the strips. The general program for the IBM 650 computer and the results obtained with a test strip are explained. (Author)

AD-261 863 Div. 2, 24
(24 Aug 61) OTS price $9.10

Milan U. (Italy).
SOLAR PERISCOPE AND STATOSCOPE IN ANALYTICAL AERIAL TRIANGULATION. THEORY AND PRACTICE,
by Giuseppe Inghilleri. Dec 60, 106p. incl. illus. (Technical paper no. 3)
(Contract AF 61(052)94)
(RADC TN 61-172) Unclassified report

DESCRIPTORS: *Mapping, Aerial Photography, Astronomical cameras, Sun, Optical images, Photographic plates, Wide field cameras, Corrections, Numerical methods and procedures, Programming, Digital computers, Stereoscopic projectors.

Contents:
Solar equations
Analytical determination of the camera periscope setting
The solar equations in the formation of the model
Solar data in the absolute orientation of the model
Use of the statoscope data in the analytical triangulation
Project of a solar flight and determination of the solar data
The calculation programs on the electronic computer IBM 650
Results of a test strip

AD-261 864 Div. 2, 24
(24 Aug 61) OTS price $8.10

Milan U. (Italy).
STUDY OF ANALYTICALLY COMPUTED GEODETIC CONTROL EXTENSION USING AERIAL PHOTOGRAMMETRIC DATA.
Final technical rept.,
by G. Inghilleri. 30 Mar 61, 85p. incl. illus.
(Contract AF 61(052)94)
(RADC TR 61-173) Unclassified report

DESCRIPTORS: *Mapping, *Aerial photography, *Geodesics, Topographic cameras, Aerial cameras, Corrections, Numerical methods and procedures, Programming, Digital computers, Stereoscopic projectors.

AD-261 865 Div. 2, 24
(24 Aug 61) OTS price $1.60

Milan U. (Italy).
STUDIES ON ANALYTICAL AERIAL TRIANGULATION.
Summary rept.
31 Jan 60, 13p. incl. illus.
(Contract AF 61(052)94)
(RADC TR 61-201) Unclassified report

DESCRIPTORS: *Mapping, *Aerial photography, Stereoscopic projectors, Astronomical cameras, Corrections, Numerical methods and procedures, Programming, Digital computers, Photographic equipment, Sun, Optical images.

AD-261 937 Div. 2
(28 Aug 61) OTS price $7.60

Air Weather Service, Scott Air Force Base, Ill.
PREPARING THE REGIONAL SURFACE PROGNOSIS AT THE TOKYO WEATHER CENTRAL,
by Herbert Edson. Apr 61, 74p. incl. illus.
(Technical rept. no. 152)
Unclassified report

DESCRIPTORS: *Weather forecasting, Meteorology, Meteorological data, *Air mass analysis, Surface properties, Meteorological charts, Japan, Jet streams (Meteorology), Test methods, Vortices, Atmosphere, Numerical analysis.

AD-261 980 Div. 2, 8, 6
(25 Aug 61) OTS price $1.60

Cruft Lab., Harvard U., Cambridge, Mass.
A THEORY OF RADAR REFLECTIONS FROM A STATISTICALLY ROUGH MOON,
by Donald F. Winter. 5 June 61, 20p. incl. illus.
(Technical rept. no. 343)
(Contract Nonr-186632, Proj. NR 371-016)
Unclassified report

DESCRIPTORS: *Moon, *Radar reflections, Surface properties, Extraterrestrial geography, Theory, Radar signals, *Wave transmission, Radar echo areas, Scattering, Statistical analysis, Radiofrequency pulses, Magnetic fields, Experimental data, Radio astronomy.

The stochastic average of the power scattered by a statistically rough moon is derived for both continuous wave and short pulse transmission. In the latter case the pulse modulation of the incident fields is taken into account explicitly. The details of the echo shape during the early part of the return are made available as a consequence. The theoretical results are compared with two different experiments. (Author)

AD-262 013 Div. 2, 12, 25
(29 Aug 61) OTS price $9.60

Stanford Research Inst., Menlo Park, Calif.
THE METEOROID AND COSMIC-RAY ENVIRONMENTS OF SPACE VEHICLES AND TECHNIQUES FOR MEASURING PARAMETERS AFFECTING THEM.
Rept. for 15 Feb-15 Nov 60 on Study of Techniques for Measuring Parameters Affecting Space Vehicle Structures,
by R. C. Goettelman, S. D. Softky and others.
Feb 61, 115p. incl. illus. tables, 86 refs.
(Contract AF 33(616)7015)
(WADD TR 60-846) Unclassified report

DESCRIPTORS: Guided missiles, *Meteorites, *Cosmic rays, *Spaceships, Measurement, Van Allen radiation belt, Particles, Instrumentation, Geophysics, Terrestrial magnetism, Solar atmosphere, *Space environmental conditions.

This study of the meteoroid and cosmic-ray environments of vehicles in space incorporates both terrestrial observations of the secondary effects of mechanisms that operate above the earth's atmosphere and the data obtained from in situ measurements by rocket- and satellite-borne detectors. Several meteoroid environment models are suggested, including: a continuous particle field with no time variation of flux; representing the long-period loading conditions for a space vehicle, a model to represent meteoroid clouds (as contrasted to the continuous particle field) which might damage such vehicles during flight, and an altitude-dependent modification of the continuous particle field model which postulates a meteoroid halo (or belt) surrounding the earth to an altitude of about 4000 km. Techniques for measuring the meteoroid and cosmic-ray environments are discussed, and some new approaches for detector developments are presented. Several general methods for monitoring space vehicle integrity are presented. (Author)

AD-262 182 Div. 2
(30 Aug 61) OTS price $6.60

Space Physics Research Lab., U. of Michigan, Ann Arbor.
MEASUREMENT OF ATMOSPHERIC PRESSURE, TEMPERATURE, AND DENSITY AT VERY HIGH ALTITUDES.
Final scientific rept.
by A. F. Nagy, N. W. Spencer and others. Aug 61, 58p. incl. illus.
(Contracts DA 36-039-sc-78131, DA 20-018-509-ORD-103 and NASw-175)
Unclassified report

DESCRIPTORS: *Ionosphere, Barometric pressure, Temperature, Density, High altitude, Measurement, Sounding rockets, Satellite vehicles, Ionization gages, Recording devices, Vacuum systems, *Neutron detectors, Meteorological instruments.

Research effort is described in developing a system capable of measuring atmospheric structural parameters above the 100-km level. The sensors to be employed would be of the ionization gage type. Study indicated that one might have a much more successful experiment if the container housing the sensors could be separated from the rocket, preferably in a degassed condition to minimize background contamination. The general research effort included (1) theoretical study of the general measurement problem; (2) development of suitable sensors; (3) development of associated electronic circuits; (4) development of a high-vacuum system to enable study and calibration of the sensors; and (5) development of the nose-cone system to carry and eject the experiment. (Author)

AD-262 233 Div. 2, 25
(31 Aug 61) OTS price $1.60

Research Inst. of Science and Engineering, U. of Detroit, Mich.
DETECTION OF GRAVITATIONAL RADIATION BY ROTATIONAL DECAY.
Interim rept. no. 9,
by Donald J. Kenney. 15 Aug 61, 11p. illus. tables.
(Contract DA 44-177-tc-519)
Unclassified report

DESCRIPTORS: *Gravity, Vacuum systems, *Magnetic fields, Theory, Drag, *Alpha decay, Pressure, Hysteresis, Tests, Measurement, Tachometers, Instrumentation, Test equipment, Infrared radiation, *Relativity theory.

The analysis of an experience with a small high speed rotor is given. It pertains to the feasibility of performing an experiment of gravitational radiation of the order one cycle to 3rd power. Such radiation is predictable within the gravitational theory of G. D. Birknoff (AD-257 982). The experiment includes a study of vacuum magnetic fields, eddy currents, electrostatic charge, vibration, tachometer system, effects of light, and frequency dependence.

AD-262 255 Div. 2
(5 Sep 61) OTS price $2.60

Free U., Berlin (Germany).
EXAMINATION OF 24 HOUR SURFACE CHARTS.
Final technical rept., pt. 2, 1 Aug 60-31 July 61.
by J. Clauss. 31 July 61, 1v. incl. tables.
(Contract DA 91-591-EUC-1521, Proj. 01-4756-60)
Unclassified report

DESCRIPTORS: *Cyclones, *Anticyclones, *Weather forecasting, *Meteorological charts, Tables, Statistical functions, Diurnal variations, Atmosphere, Meteorological data.

This analysis deals with the examination of 24 hr surface prognostic charts of the Dunstable, Offenbach, and Moscow weather centers. By considering only the centers of cyclones and anticyclones the problem was simplified fundamentally, so that a relation could be established to meteorological processes that produce the 24 hr changes. By a procedure similar to the correlation method, quality numbers were received, by which not only the efficiency was compared but also with the help of sufficiently large populations to give a quantitative picture of the present status of development prognosis. The results of two 9 months populations and one 18 months population are presented in particular. (Author)

AD-262 256 Div. 2
(18 Sep 61) OTS price $1.60

Free U., Berlin (Germany).
EXAMINATION OF 24 HOUR SURFACE CHARTS.
Quarterly technical status rept. no. 1, 1 Aug-31 Oct 60 and Final technical rept., pt. 1, 1 Aug 60-31 July 61,
by J. Clauss. 31 July 61, 19p. incl. illus. tables.
(Contract DA 91-591-EUC-1521, Proj. 01-4756-60)
Unclassified report

DESCRIPTORS: *Weather forecasting, *Cyclones, *Anticyclones, Tables, Diurnal variations, *Meteorological charts, Statistical functions, Atmosphere, Meteorological data.

AD-262 284 Div. 2, 8, 30
(1 Sep 61) OTS price $2.60

Kiruna Geophysical Observatory (Sweden).
SOME CHARACTERISTICS OF A SWEPT FREQUENCY INTERFEROMETER FOR 35-65 Mc/s.
Annual summary rept. no. 1, 16 Feb 60-15 Feb 61,
by Bengt Hultqvist and Ludwik Liszka. 15 Feb 61, 29p. incl. illus. table.
(Contract AF 61(514)1314)
(AFCRL-516) Unclassified report

DESCRIPTORS: Sweden, Interferometers, Very high frequency, *Radio astronomy, *Atmospheric refraction, Ionosphere, Measurement, Intensity, Modulation, Theory, Extraterrestrial radio waves, Radiofrequency spectrum analyzers, Spectrographic analysis, Helical antennas, Antennas, Recording systems, *Radio interference, Radio interference analyzers, Phase measurement, Electromagnetic wave reflections, *Radio interferometers, *Ionospheric propagation.

A radio astronomical, swept frequency interferometer was operated to: (1) investigate the ionospheric refraction of radiation in the frequency range 35-65 mc, and its dependence on geometrical and time parameters, and (2) investigate angular scintillations in the same frequency range, and other short-time variations in the refraction angle. A theory of the 3-dimensional (intensity modulated) record of a swept frequency interferometer is discussed. The simple theory assumes a frequency independent interferometer. The more exact theory includes the influence of a frequency dependent hybrid and gives rather complicated equations, which can be solved only in the numerical way. The influence of ground reflections on the observed interference pattern is also discussed. A method of the determination of the ionospheric refraction from swept frequency record is described. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-262 168 Div. 3, 10
(24 Aug 61) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
INHIBITION OF FLASHING OF AEROSOLS.
Quarterly progress rept. no. 5, 15 Apr-14 July 61,
by C. C. Miesse. 15 July 61, 18p. incl. illus. table.
(Contract DA 18-108-405-cml-777)
Unclassified report

DESCRIPTORS: *Aerosols, Aerosol generators, Ignition, Flame propagation, Combustion, Butyl radicals, Phthalates, Phosphites, Hydrogen compounds, Ethyl radicals, Liquids, Drops, Photographic analysis, Inhibition, Measurement.

Quantitative and qualitative tests were performed with dibutyl phthalate (DBP) and bis (2-ethylhexyl) hydrogen phosphite (B2EHHP) aerosols. Both aerosols were found to be quite flammable, and the B2EHHP aerosol flame front, on one occassion, propagated several times faster than the DBP during its tests. DBP lean limits of 27.8 to 17.3 mg/l for 74 to 130 micron-mean-weight-diameter aerosols indicate that the lean limit decreases as the drop size increases in this size range. Ignition studies indicated that it was not possible to ignite flammable concentrations of DBP aerosols with spark discharge or exploded wire ignition systems. Hot wire, 110v shorted nichrome wire, and gas flame ignition systems resulted in identical lean limits in DBP, although the gas flame ignition system is the most positive ignition source. (Author)

4. CHEMISTRY

AD-261 530 Div. 4, 20
(18 Aug 61) OTS price $1.10

Los Angeles State Coll., Calif.
B5H9 - DC1 EXCHANGE CATALYZED BY AlC13,
by Thomas P. Onak and Robert E. Williams.
10 Aug 61, 5p. illus. table (Technical rept. no. 1)
(Contract Nonr-336400, Proj. NR 052-427)
Unclassified report

DESCRIPTORS: *Pentaboranes, *Deuterated compounds, Chlorides, Exchange reactions, Catalysis, Catalysts, Aluminum compounds, Chemical reactions, Hydrogen, Deuterium, Nuclear magnetic resonance, Synthesis, Spectrographic analysis, Infrared spectroscopy.

Treatment of pentaborane with deuterium chloride results in the rapid exchange of hydrogen and deuterium in the 1-position. 1-Deuteropentaborane was identified by the B-11 and H-1 nmr spectra and confirmed by the stoichiometry of the exchanging species at equilibrium. (Author)

AD-261 641 Div. 4, 25, 30
(21 Aug 61) OTS price $4.60

Ultrasonics Research Lab., Western Reserve U., Cleveland, Ohio.
FUNDAMENTAL AND PROCESSING APPLICATIONS FOR SOUND WAVES IN CHEMISTRY,
by Ernest Yeager. 1 July 61, 49p. incl. illus. 107 refs. (Technical rept. no. 24)
(Contract Nonr-143904, Proj. NR 384-305)
Unclassified report

DESCRIPTORS: *Sound, *Electrochemistry, Test methods, Electrolytes, *Ultrasonics, Electrodes, Relaxation time, Reaction kinetics, Solutions, Vibration, Wave transmission, Hall effect, Electrical conductance, Degasification, Colloids, Hydrogen electrodes, Oxygen electrodes, Chlorine, Coagulation, *Desalination, Sea water, Processing, Electrodeposition, Porous materials, Transport properties, Crystallization, Polymerization, Chemical reactions, Bibliography.

A survey is presented of applications for acoustical waves in chemistry to provide background information on fundamental and processing applications which are related even somewhat remotely to research on desalination of sea water. Emphasis has been placed on fundamental electrochemical applications involving the use of ultrasonic techniques for the study of the structure of electrolytes, the kinetics of fast homogeneous reactions in solutions, the kinetics of electrode processes, and the structure of solid-electrolytic solution interfaces. Processing applications which are described include increased mass and heat transfer in fluids, dispersion and coagulation effects, degassing of liquids, crystallization phenomena, and sonochemical effects. (Author)

AD-261 707 Div. 4
(22 Aug 61) OTS price $3.60

Kansas U., Lawrence.
FACTORS AFFECTING THE POSITION OF ALKYLATION OF

ALKALI METAL SALTS OF PYRROLE WITH ALLYLIC HALIDES.
Rept on Nitrogen Constituents of Petroleum,
by Charles F. Hobbs, Carl K. McMillin, and others.
13 Mar 61, 37p. incl. illus. tables, 32 refs.
(In cooperation with the Bureau of Mines Experiment Stations, in Laramie, Wyoming and Bartlesville, Oklahoma.)
Unclassified report

DESCRIPTORS: *Alkali metal compounds, Salts, *Pyrroles, Allyl radicals, Butenes, Benzyl radicals, Chemical reactions, Alkyl radicals, Halides, Substitution reactions.

The reaction of alkali-metal salts of pyrrole with allyl, crotyl and benzyl halides affords a mixture of the 1- and 2-substituted pyrroles, along with varying amounts of disubstituted pyrroles. It has been found that the product ratio of the two monosubstituted pyrrole isomers in each case is affected markedly by the nature of the medium and of the metal ion. In general, the percentage of alkylation at the nitrogen atom (1-position) increases with the solvating power of the medium and decreases with the coordinating ability of the metal ion. These effects are explained on the basis that dissociation of the pyrryl-metal ion pair favors nitrogen alkylation. It has been shown that disubstituted pyrroles arise only from 2-alkylated pyrroles by further alkylation. (Author)

AD-261 727 Div. 4
(22 Aug 61) OTS price $1.10

Pennsalt Chemicals Corp., Wyndmoor, Pa.
THE THERMAL STABILITY OF METAL AMMINES (AND RELATED COMPOUNDS). IV. SOME OBSERVATIONS ON 2,2'-IMINODIPYRIDINE-ZINC COORDINATION COMPOUNDS,
by Joseph Simkin and B. P. Block. July 61, 7p. incl. table, 14 refs. (Technical rept. no. 22)
(Contract Nonr-268700, Proj. 356-408)
Unclassified report

DESCRIPTORS: *Complex compounds, *Metalorganic compounds, *Ammino compounds, Stability, Temperature, Imides, *Pyridines, Chlorides, Cyano radicals, Acetates, Polymers, *Zinc compounds, Synthesis.

The thermal behavior of the three new compounds 2,2'-iminodipyridinedichlorozinc(II) and its cyano and acetato analogues shows that their relative thermal stability depends on the anion, with the order of decreasing stability chloro greater than acetato greater than cyano. This order is inversely related to the strength with which the anions bridge between zinc ions. (Author)

AD-261 728 Div. 4
(22 Aug 61) OTS price $1.10

Pennsalt Chemicals Corp., Wyndmoor, Pa.
INORGANIC COORDINATION POLYMERS. I. GENERAL CONSIDERATIONS,
by B. P. Block and G. Barth-Wehrenalp. July 61, 8p. (Technical rept. no. 23)
(Contract Nonr-268700, Proj. NR 356-408)
Unclassified report

DESCRIPTORS: *Polymers, *Inorganic substances, *Complex compounds, Synthesis, *Polymerization, Condensation reactions, Chemical reactions.

Synthetic approaches to coordination polymers are classified as condensation polymerizations, addition-type polymerizations involving coordinatively-unsaturated intermediates, and degradation polymerizations. The first two classes are further subdivided into homocondensations and heterocondensations and into elimination-additions, substitution-additions, oxidation-additions, redistribution-additions, and rearrangement-additions, respectively. These various classes are discussed. (Author)

AD-261 729 Div. 4
(22 Aug 61) OTS price $2.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
INORGANIC COORDINATION POLYMERS. II. MONOAMMINE-DICHLOROZINC(II).
by B. P. Block, R. A. Florentine, and others.
July 61, 13p. incl. table, 23 refs. (Technical rept. no. 24)
(Contract Nonr-268700, Proj. NR 356-408)
Unclassified report

DESCRIPTORS: *Polymers, *Complex compounds, *Inorganic substances, *Ammino compounds, Chlorides, *Zinc compounds, Polymerization, Synthesis, Stability, Temperature, Solubility, Molecular weight, Viscosity, Electrical conductance, Measurement, Chemical reactions, Molecular structure.

Diamminedichlorozinc(II) was converted to monoamminedichlorozinc(II) by thermal loss of one mole of ammonia or by reaction with one mole of zinc chloride. The monoammine does not distill without decomposition as reported in the literature. Its physical appearance, melt viscosity as a function of temperature, and melt conductivity as a function of temperature suggest a polymeric structure. Molecular weight determinations and solution conductivity indicate that the structure is depolymerized in coordinating solvents. A branched chain structure is proposed. (Author)

AD-261 748 Div. 4, 16, 30
(22 Aug 61) OTS price $8.60

Wayne State U., Detroit, Mich.
LIGHT SCATTERING OF FLOWING COLLOIDAL SYSTEMS,
by Louis A. Papazian. 31 Aug 61, 97p. incl. illus. tables (Technical rept. no. 46)
(Contract Nonr-73600)
Unclassified report

DESCRIPTORS: *Colloids, Test methods, Theory, Test equipment, Measurement, Optical equipment, Photometers, *Physical chemistry, Light, Particles.

A method was developed for the purpose of determining the size and shape of anisometric colloidal particles and flexible macromolecules. The experimental technique used for this determination is the measurement of the change in the intensity of the light scattered by anisometric colloidal particles (or macromolecules) when oriented (or deformed) by a velocity gradient. Improvements in the system will extend the present range of measurements to rigid colloidal particles whose longest dimension is less than 300 mu and to high molecular weight polymers. The apparatus has been successfully tested with suspensions of tobacco mosaic virus and the experimental results have been compared with the theory of Okano and Wada (J. Chem. Phys., 34: 405, 1961) for thin rod-like particles. Preliminary observations made with flexible macromolecules indicate that the effect of deformability of high molecular weight polymers, subjected to a velocity gradient, is quite small under the conditions of this study, as predicted theoretically. (Author)

AD-261 839 Div. 4
(24 Aug 61) OTS price $1.10

Applied Science Labs., Inc., State College, Pa.
RESEARCH STUDY OF PHYSICOCHEMICAL TECHNIQUES FOR THE PURIFICATION OF ORGANIC COMPOUNDS.
Bimonthly progress rept. no. 17, 1 May-1 July 61, by Robert F. Sweeny and Arthur Rose. 18 Aug 61, 7p. incl. illus. tables.
(Contract DA 18-108-405-cml-176)
Unclassified report

DESCRIPTORS: *Films, Membranes, *Organic solvents, *Organic compounds, *Purification, Diffusion, Polymers, Solutions, Hexanes, Methanes, Alcohols, Ethanols, Ethylenes, Cellulose acetates, Cellulose esters, Vinyl chlorides, Semipermeability.

Comparison of rate results from one film to another in terms of the nature of the permeating molecule and its interaction with the film can be made using a parameter called rate factor (RF). RF = R/R sub NH, where R is the measured rate of any particular permeant and R sub NH the rate for neohexane (2-2-dimethylbutane) through the same kind of film under the same conditions. The measurement of neohexane rates for various combinations are cited. Rate determinations were made for pentane, hexane, heptane, decane, and tridecane through polypropylene; and ethanol, butanol, hexanol, and heptanol through cellulose acetate. Results for both groups approximated a linear log rate versus C number relationship. Five binary tests were made for a vinyl chloride-acetate film; 2 resulted in almost immediate film failure.

AD-261 860 Div. 4
(25 Aug 61) OTS price $1.10

Illinois State Geological Survey, Urbana.
A STUDY OF THE ACTIVATION (LABILIZATION) OF FLUORINE ATOMS OF BENZENE BY NEIGHBORING FUNCTIONAL GROUPS.
Final rept., 1 Sep 54-30 Sep 58 on Aromatic Fluorine Compounds, Chem. 30-28,
by G. C. Finger. 29 Dec 58, 2p.
(Contract AF 18(600)985)
Unclassified report

DESCRIPTORS: *Fluorides, *Benzenes, *Fluorination, Labeled substances, Chlorides, Potassium compounds, Synthesis, Chemical reactions, Exchange reactions, *Fluorocarbons.

Many aromatic fluorine compounds can now be synthesized readily by an aryl Cl-KF exchange reaction. The development of this exchange reaction involved studies on (1) the activation of halogen atoms in aromatic systems; (2) the use of organic solvents, especially dimethyl formamide and dimethyl sulfoxide, in the exchange reaction, (3) the mechanics of the reaction; and (4) factors governing the choice of metallic fluoride. Publications and lectures summarizing the results of this program are given. (Author)

AD-261 910 Div. 4
(25 Aug 61) OTS price $2.60

Theoretical Chemistry Lab., U. of Indiana, Bloomington.
THE CHEMICAL BOND IN MOLECULAR QUANTUM MECHANICS,
by Thomas L. Allen and Harrison Shull. 1 July 61, 28p. 38 refs.
(Contract AF 49(638)318)
(AFOSR-494) Unclassified report

DESCRIPTORS: *Quantum mechanics, *Chemical bonds, Molecules, Atomic orbitals, Electron transitions, Electrons, Energy, Benzenes, Theory.

It is postulated that a properly antisymmetrized product function over geminals (electron-pair wave functions) is adequate for discussion of the principal chemical properties of molecules. By application of the virial theorem, it is shown that such a wave function has both of the properties essential to the bond energy concept; namely (a) the energy of a molecule is the sum of the energies of its individual bonds and (b) the bond energies are invariant from one molecule to another. Within the framework of this approximation, bond energies become identified in magnitude with the kinetic energies associated with the respective geminals. The concepts are sufficiently general to include both localized and non-localized bonds, unshared electron pairs, odd electrons, and states of various multiplicities. (Author)

AD-261 921 Div. 4, 20
(25 Aug 61) OTS price $11.50

Michigan U., Ann Arbor.
THE ENERGY DEPENDENCE OF X-RAY DAMAGE IN AN ORGANIC MERCURY COMPOUND.
Rept. no. 6 on Resonance in Radiation, Doctoral thesis,
by Marvin Cleveland Atkins. 1960, 145p. incl. illus. tables, 41 refs.
(Sponsored by the Air Force Institute of Technology)
Unclassified report

DESCRIPTORS: *Metalorganic compounds, *Mercury compounds, *Chelate compounds, Styrenes, Carboxylic acids, Esters, Ethyl radicals, Benzenes, *Radiation damage, X rays, Photons, Photon bombardment, Chlorides, Crystals, Synthesis, Purification, Chemical analysis, Molecular structure, Radiochemistry, Dithizone, Spectrographic analysis, Atomic spectrum, Electron transitions, Dosimeters, Energy, Decomposition, Ionization.

An investigation was conducted of the extent to which the x-ray decomposition of an organic Hg compound depends on the photon energy of the x-rays. Samples of alpha-acetoxymercuri-beta-methoxy-hydrocinnamic ethyl ester were irradiated with monochromatic x-ray beams at a number of different energies between 9 and 19 kev. The energy region included the L-absorption edges of Hg. Results demonstrated that there was no dependence of radiation yield on the total dose or dose rate used. Six samples of the ester were irradiated with unfiltered L-spectra of 6 consecutive elements, including Hg. The radiation yield was independent of photon energy between 9 and 18 kev. The amount of Hg liberated per unit energy was the same, within experimental uncertainty, for soft x-rays and Co-60 radiation.

AD-261 944 Div. 4
(28 Aug 61) OTS price $1.60

Naval Ordnance Lab., Corona, Calif.
A STUDY OF REACTIONS FOR THE PREPARATION OF PERFLUOROALKYLALUMINUM COMPOUNDS,
by Andrew J. Bilbo and Bodo Bartocha. 15 July 61, 14p. incl. illus. 18 refs.
(NAVWEPS rept. no. 7188) Unclassified report

DESCRIPTORS: *Aluminum compounds, Alkyl radicals, Fluorides, *Metalorganic compounds, Synthesis, Chemical reactions, Preparation, Chlorides, Hydrides, Vinyl radicals.

A study was undertaken to find a suitable synthesis for the preparation of perfluoroalkylaluminum compounds. Several of the reactions carried out were unsuccessful: The reaction of (CF2:CF)MgBr with AlCl3 in THF resulted in a polymeric substance which upon hydrolysis gave an amount of CF2:CFH corresponding to a yield of 50% (CF2:CF)3Al:O(CH2)4, but no distillable material could be isolated; the reaction of (CF2:CF)2Hg with aluminum powder failed to yield any identifiable perfluorovinylaluminum compound; and the reaction of (CF2:CF)2Hg with AlCl3 produced only a polymer. When (CF2:CF)2Hg was treated with AlH3:NMe3 in ether, (CF2:CF)3Al:NMe3 resulted; and the compound (CF2:CF)2AlH:NMe3 could be isolated from a synproportionation of AlH3:NMe3 and (CF2:CF)3Al:NMe3. CF3AlH2:NMe3, in polymeric form, was synthesized from the reaction of AlH3:NMe3 with (CF3)2Hg. (Author)

AD-261 971 Div. 4
(28 Aug 61) OTS price $1.60

British Columbia U., (Canada).
TRIFLUOROMETHYL COMPOUNDS OF GERMANIUM.
Rept. on Volatile Fluoro Compounds,
by H. C. Clark and C. J. Willis. July 61, 11p. 11 refs. (Technical rept. no. 3)
(Contract Nonr-265900, Proj. NR 052-403)
Unclassified report

DESCRIPTORS: *Germanium compounds, Iodides, *Fluorides, Chlorides, Chlorine compounds, *Halides, Methyl radicals, *Metalorganic compounds, Methanes, Tin compounds, Arsenic compounds, Stability, Pyrolysis, Hydrolysis, Potassium compounds, Chemical reactions, Synthesis, Chemical bonds, Alkyl radicals.

Use was made of the strong reducing power of the Ge halides in the synthesis of trifluoromethyl Ge compounds. The reaction CH3I + GeI2 yields CH3GeI3 constitutes the most convenient method of methyltri-iodogermane preparation. CF3GeI3 was obtained by reacting GeI2 with CF3I. The thermal stability by CF3GeI3 was studied by pyrolyzing the compound alone. It appeared stable when heated in vacuo to 150 degrees for 3 days, but decomposed slowly when the temperature was raised to 180 degrees. The derivatives, CF3GeCl3 and CF3GeF3, were easily prepared by reacting CF3GeI3 with the appropriate Ag halide. Hydrolysis of the trifluoromethylhalogermanes is discussed. Analogous reactions involving other group IV elements, Si, Sn and Pb are also described.

AD-262 065 Div. 4
(30 Aug 61) OTS price $3.60

Milan U. (Italy).
STUDIES ON RHENIUM COORDINATION COMPOUNDS. HEXAISOCYANIDERHENIUM(1) SALTS (PART I).
STUDIES ON IRIDIUM COMPOUNDS. ISOCYANIDE DERIVATIVES OF IRIDIUM CARBONYL DERIVATIVES OF IRIDIUM IODIDES (PART II).
Final technical rept.,
by Lamberto Malatesta. 31 Mar 61, 32p. incl. tables, 15 refs.
(Contract AF 61(052)83)
(AFOSR-1204) Unclassified report

DESCRIPTORS: *Rhenium compounds, *Complex compounds, Salts, *Iridium compounds, Carbonyl radicals, Iodides, Nitriles, Potassium compounds, Infrared spectroscopy, Chemical reactions, Synthesis, Preparation.

The reaction of ReI3 with p-tolylisocyanide at 150 degrees and with ethylisocyanide at room temperature gives the triiodide of the hexaisocyaniderhenium(I) cations (Re(RNC)6)(+). Both the aliphatic and aromatic derivatives are stable, diamagnetic substances, from which other salts as the iodide, the perchlorate, etc. have been prepared. From the reaction of Ir(CO)2(p-toluidine) (Cl) with p-tolylisocyanide (RNC) the cations (Ir(CO) (RNC)3)(+) and (Ir(RNC)4)(+) were obtained in solution and isolated as salts with bromide, perchlorate and iodide anions. The reaction of IrI3 and IrI4 alone, and in mixture with KI, with carbon monoxide at high pressure gave the following products: (1) (Ir(CO)3I3); (2) (Ir(CO)2I3)2; (3) (Ir2(CO)3I6); (4) (Ir(CO)2I2); (5) Ir(CO)3I); (6) K(IrIII)(CO)2I3); (7) K(IrIII)(CO)I4); (8) K(Ir(III)(CO)2I4) (9) K(Ir(III)(CO)I5); and (10) K2IrI5. (Author)

AD-262 103 Div. 4, 25, 20
(29 Aug 61) OTS price $42.00

Uppsala U., (Sweden).
PREPRINTS OF PAPERS PRESENTED AT THE FIFTH INTERNATIONAL SYMPOSIUM ON FREE RADICALS, JULY 6-7, 1961, INSTITUTE OF PHYSICAL CHEMISTRY, UPPSALA UNIVERSITY, UPPSALA, SWEDEN.
1961, 847p. incl. illus. tables.
(Contract DA 91-591-EUC-1763)
Unclassified report

DESCRIPTORS: *Free radicals, *Symposia, Low temperature research, Stability, Chemical reactions, Spectrographic analysis, Nuclear spins, Photochemistry, Photochemical reactions, Paramagnetic resonance, Radiation damage, Polymers.

Reprints are presented of the 8 plenary lectures and the 76 contributed papers given at the symposia. These papers are grouped by the session at which they were presented. The session topics were: (1) low temperature stabilization of free radicals; (2) studies of free radicals trapped in macromolecular systems; (3) free radical reactions at low temperatures; (4) spectroscopic studies on free radicals; (5) electron spin resonance studies on free radicals; (6) properties and reactions of radicals produced by high energy radiation; and (7) photochemical studies on free radicals.

AD-262 167 Div. 4, 14
(31 Aug 61) OTS price $2.60

Aerojet-General Corp., Azusa, Calif.
RESEARCH AND DEVELOPMENT OF HIGH-TEMPERATURE-STABLE INORGANIC RESINS AND ELASTOMERS.
Annual summary rept., 1 July 60-27 June 61,
by Joseph Feltzin. 3 Aug 61, 22p. incl. tables,
(Rept. no. 2058)
(Contract DA 04-495-ORD-3075)
Unclassified report

DESCRIPTORS: *Silicates, *Silicon compounds, Mica, Asbestos fiber, Polymers, *Heat resistant polymers, High temperature research, Polymerization, Copolymerization, Synthesis, Silanes, Chlorides, Sodium compounds, Stability, Molecular structure, Crystal structure, Spectrographic analysis, Chemical reactions, Glass, Inorganic substances, Mechanical properties, *Resins, *Elastomers.

The preparation of thermally stable, flexible and elastic silicates was investigated. The study included attempts to modify the natural silicates, mica and asbestos, and the synthesis of silicate polymers from simpler materials. Polymers having good thermal stability, flexibility, and elasticity were prepared by the reaction of sodium ortho- and metasilicates with dimethyldichlorosilane (DMDS). The parameters of this reaction such as solvent, temperature, molar ratios, and variation of the silane constituent were also investigated. Some qualitative physical and chemical properties of the resulting polymers were obtained. (Author)

AD-262 229 Div. 4, 10
(31 Aug 61) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
CHEMIONIZATION IN THREE-BODY GAS PHASE REACTIONS,
by C. Gatz, F. T. Smith, and H. Wise. July 61, 4p. illus. (Proj. Squid technical rept. no. SRI-11-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR 098-038)
Unclassified report

DESCRIPTORS: *Recombination reactions, *Nitrogen, *Cesium, Atoms, Gas ionization, Ionization, Transport properties, Electrical properties, Jet flames.

A study of the kinetics of production of charged particles by exothermic chemical reactions was made to elucidate the mechanism of chemionization. The chemionization of cesium by homogeneous recombination of N atoms was studied: N + N + Cs yields N(2) + Cs(+) + e(-). A Polanyi diffusion flame was established in a mixture of Cs vapor and partially dissociated N gas. The Cs vapor concentration was estimated as 10 to the 13th power atoms/cc. The current appeared to saturate, i.e. to become independent of voltage, at about 30 v. Typical saturation currents were 0.1 microamp. Without Cs or gas excitation, background currents were less than 0.002 microamp. The N atom concentration was determined as a function of pressure and transmitter power by catalytic microcalorimetry; the apparent saturation current was proportional to the square of the atom concentration. When a negligible fraction of charge removal was due to processes other than collection at the electrodes, the current was about equal to the rate of charge production.

5. COMMUNICATIONS

AD-261 546 Div. 5, 8
(21 Aug 61) OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPECIFICATIONS FOR A COBI DATA TRANSMISSION MODEM,
by E. J. Hofmann. 18 July 61, 47p. incl. illus. tables (Rept. no. 25G-0035)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Data transmission systems, *Digital systems, *Coding, Phase modulation, Electronic circuits, Specifications, Communication systems, Electronic circuits.

The COBI Data Transmission Modem is a 1200 bit/second coded phase reversal system. The term COBI is an acronym for Coded Biphase. COBI utilizes a double side-band phase reversal modulation with a carrier centered at 1500 cps. The 1200 bit/second data are recorded into a 1500 digit/second data stream. Actual phase modulation is accomplished at a 1500 baud rate. Coding is accomplished by converting every four input data bits into a five-bit character. Each conversion is unique. (Author)

AD-261 583 Div. 5
(21 Aug 61) OTS price $19.75

General Precision Lab., Inc., Pleasantville, N. Y.
OPTICAL COMMUNICATION. I.
Technical note,
by D. S. Bayley. May 61, 340p. incl. illus. tables, 129 refs. (Rept. no. A24-2)
(Contract AF 30(602)2203, Proj. 4519)
(RADC TN 61-117) Unclassified report

DESCRIPTORS: Radio communication systems, *Light communication systems, Microwave oscillators, Oscillators, Satellite vehicles, *Re-entry vehicles, Microwave amplifiers, *Signal-to-noise ratio, Modulators, Optical filters, Earth, Detectors, Night sky, Transmitter receivers, Relays, Moon, Mars, Statistical distributions, Information theory, Integral equations, Communication systems, Electromagnetic theory, Luminescence, Phosphorescence, Electric discharges, Lenses, Mirrors, Diffraction, Statistical analysis.

The potentials of optical maser, radio and conventional optical communication systems are compared. Optical maser systems of voice channel capacity for communication between two ground stations linked by a passive, diffusely reflecting satellite and between the earth and a re-entry vehicle are analyzed in some detail and compared with similar systems using conventional optical sources. The results show that use of an optical maser amplifier as well as an oscillator will require less than one hundredth of the transmitted power necessary in a system using only an optical maser oscillator, and demonstrate that conventional optical sources are unsuitable for use in the system. (Author)

AD-261 796 Div. 5
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CQSSB.
14 July 61, 3p. (Trans. no. MCL-964 of Radio 3:33-34, Mar 61)
Unclassified report

DESCRIPTORS: *Radio communication systems, *Radio stations, Radio operators, Sidebands, USSR.

AD-261 995 Div. 5, 30
(25 Aug 61) OTS price $5.60

Diamond Ordnance Fuze Labs., Washington, D. C.
AIRBORNE TAPE RECORDER FOR USE IN NUCLEAR ENVIRONMENTS,
by Joseph M. Vallin. 20 June 61, 66p. incl. illus. tables (DOFL rept. no. TR-919)
(Proj 24200)
Unclassified report

DESCRIPTORS: Magnetic tape, *Magnetic recording systems, Recording devices, Airborne, Radiation damage, Radioactivity, *Telemeter systems, Reliability, *Sound reproduction systems, Electronic circuits, Packaging, Nuclear explosions, Instrumentation, Oscillators, Timing circuits, Design, Tests, Electromagnetic shielding, Nuclear weapons.

An airborne multitrack magnetic tape record and playback system was designed, constructed, and subjected to nuclear environmental tests that indicate a correct design approach. This system, designed specifically to record and playback, while airborne, the data from high-altitude nuclear weapon effects tests, had to have structural strength to withstand missile-launch environments and electronic circuitry capable of unaffected operation in nuclear environment. Extreme reliability of tape transport, electronics, programming techniques, and timing and telemetry devices was required. In the operational sequence, (1) an internal timer actuates the recording process shortly before the detonation; (2) voltages from various transducers are recorded; and (3) the system plays back the recorded information several times through radio telemetry links to the ground. (Author)

AD-262 209 Div. 5
(1 Sep 61) OTS price $4.60

Army Signal Radio Propagation Agency, Fort Monmouth, N. J.
MEDIAN SIGNAL POWER REQUIRED FOR RECEPTION OF RADIO TRANSMISSIONS IN THE PRESENCE OF NOISE,
by Luther C. Kelley and Alvaro A. Silva. June 49, rev. June 61, 46p. incl. illus. 44 refs. (Technical rept. no. 5; Supersedes ATI-199 922)
Unclassified report

DESCRIPTORS: *Radiofrequency power, Radio signals, *Radio transmission, *Radio reception, Signal-to-noise ratio, Radio interference, Noise (Radio), Atmospherics, Solar noise, *Radio communication systems, Extraterrestrial radio waves, Radio interference analyzers.

A description is given of the general nature of radio noise and data are presented in the form of maps, charts, and tables for determining the required median signal power across the receiver input for satisfactory communication in the presence of atmospheric, galactic, man-made, and receiver noise. It is based on the latest analyzed noise data. (Author)

AD-262 234 Div. 5, 8
(31 Aug 61) OTS price $9.10

RCA Defense Electronic Products, New York.
DEVELOPMENT OF SERVICE TEST MODEL OF COMMUNICATIONS SYSTEM AN/TSC-9(V).
Final rept. 28 June 58-15 Nov 60.
by S. N. Friedman and W. C. Roake. 15 Nov 60, 110p. incl. illus. table (Rept. no. CR 59-419-9 (Final))
(Contract DA 36-039-sc-78160)
Unclassified report

DESCRIPTORS: *Radio relay systems, *Radio communication systems, Frequency modulation, Pulse modulation, Coding, *Secret communication systems, Radio ranges, Mobile, Antenna masts, Antennas, Pneumatic systems, Installation, Very high frequency, Ultra high frequency, Reliability, Design, Radio equipment, Propagation, *Telephone communication systems, *Panel boards (Electricity), Tests.

The implementation phase of the FDM-FM radio relay central system is discussed. A propagation range of 35 miles in the worst case is indicated by studies based on field performance information as well as on theoretical results. The procedure for an extremely rapid set-up of a central exchange is detailed, providing for full operational capability within minutes after locating at a site. A description of the shelter-installed pneumatic mast system and of the single-radome covered, dual omnidirectional antenna which make the rapid set-up possible, is included. The installation proper and the equipment are described and special features of the system are listed. (Author)

AD-262 283 Div. 5, 8, 12
(1 Sep 61) OTS price $6.60

Kiruna Geophysical Observatory (Sweden).
INVESTIGATIONS OF RADIO TRANSMISSIONS FROM 1958 DELTA 2 (SPUTNIK III) MADE AT KIRUNA GEOPHYSICAL OBSERVATORY,
by Ludwik Liszka and Bengt Hultqvist. 15 Feb 61, 61p. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 61(514)1314)
(AFCRL-518) Unclassified report

DESCRIPTORS: *Radio transmission, Telemeter systems, *Radio signals, Ionosphere, *Satellite vehicles, Attenuation, Absorption, Doppler systems, Periodic variations, Magneto-optic rotation, Analysis, Measurement, Sweden, *Radio waves.

The methods of Doppler and signal strength measurements of Sputnik III transmissions are discussed. The dropout phenomenon and its connection with other geophysical phenomena were studied in details. Faraday fading and amplitude scintillations have been studied in connection with: magnetic activity, spread-F and sporadic E. Also diurnal and seasonal variations of the occurrence frequency of the Faraday fading and amplitude scintillations have been investigated. Measurements of the frequency of Faraday fading were used for calculations of local electron densities and total electron amount. (Author)

AD-262 285 Div. 5, 8, 12
(1 Sep 61) OTS price $2.60

Kiruna Geophysical Observatory (Sweden).
STUDIES OF HF- AND VHF- AURORAL ZONE PROPAGATION.
Annual summary rept. no. 1, 16 Feb 60-15 Feb 61,
by Ludwik Liszka. 15 Feb 61, 22p. incl. illus.
(Contract AF 61(514)1314)
(AFCRL-517) Unclassified report

DESCRIPTORS: High frequency, Very high frequency, *Satellite vehicles, *Radio transmission, *Radio waves, Propagation, Telemeter systems, *Radio signals, Sweden, Radio astronomy, Interferometers, Measurement, Analysis, *Aurorae, Protons.

The recording of satellite transmissions at Kiruna Geophysical Observatory on frequencies 20 and 108 mc is discussed. (Author)

Division 6-DETECTION

6. DETECTION

AD-261 678 Div. 6, 8
(22 Aug 61) OTS price $1.60

Litton Systems, Inc., College Park, Md.
DIRECTION FINDER GROUP AN/TLA-9 (FORMERLY OA-(XE-1)/VRD).
Quarterly progress rept. no. 4, 1 Apr-30 June 61, by J. DeStefano. 30 June 61, 16p.
(Contract DA 36-039-sc-84961)
Unclassified report

DESCRIPTORS: *Direction finding, *Parabolic antennas, Antennas, Reflectors, *Radio interception, *Radar interception, Microwave equipment, *Bearing finding, Ultra high frequency, Superhigh frequency, Radio signals, Radar signals, Radomes, Antenna hardware, Cathode ray tubes, Memory devices, Servo systems, Power supplies, Design, Countermeasures.

Efforts were continued on the design of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearings of electromagnetic signals in the frequency range of 1.0 to 10.75 kmc. Work was continued on the mechanical and electrical assembly with all electro-mechanical assemblies completed. Except for the low voltage power supply module, the power supply unit was made ready for final electrical and environmental testing. Antenna reflector and feed structures require redesign to meet vibration requirements. (Author)

AD-261 709 Div. 6, 15
(23 Aug 61) OTS price $2.60

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
A NEW APPROACH TO THE COMPARISON OF DETECTION SYSTEMS,
by Donald M. Levy. Sep 60, 21p. incl. illus. 6 refs. (Technical rept. no. 470)
(Contract AF 33(616)6131)
Unclassified report

DESCRIPTORS: *Statistical analysis, Theory, *Detectors, Detection, Signal to noise ratio, Analysis, Mathematical analysis.

The application of statistical decision theory to the problem of comparing 2 detection systems is discussed. It is shown that the optimum system is quite sensitive to the details of the noise statistics. It is concluded that if 2 systems are evaluated in the presence of the same, but not necessarily known, background statistics then the better system is that which provides a uniformly lower cost. (Author)

AD-261 745 Div. 6, 22
(23 Aug 61) OTS price $5.60

Texas Instruments, Inc., Dallas.
ANALYSIS AND REDUCTION OF DATA RECORDED UNDER PROJECT COWBOY.
Final rept.,
by Robert W. Wylie. 11 July 61, 60p. incl. illus. tables.
(Contract AF 19(604)8078)
(AFCRL-802)
(ARPA Order no. 180-61)
Unclassified report

DESCRIPTORS: Detonation, Detonation waves, *Underground explosions, *Seismic waves, *Attenuation, *Detection, Wave transmission, Seismographs, Measurement, Atomic bomb explosions, Noise, Analysis, Data, Tests, Reduction, Nuclear explosions.

The analyses conducted under Project Cowboy was performed on eight chemical detonations. These shots consisted of 200-, 500-, and 1000-pound decoupled shots in a 30-ft. spherical cavity. An additional decoupled 1000-pound shot was detonated in a 12-ft. spherical cavity. Tamped shots had yields of 200, 500, and two 1000 pounds. This study indicates that the partition of energy in a decoupled shot is different from that radiating from a tamped shot. For the various decoupled shots of different sizes this partitioning change indicated that the degree and type of decoupling varied with the size of the charge and the cavity in which it was fired. Therefore, the values of the amplitude density ratios of tamped to decoupled shots are dependent on frequency, the modes contained in the section of the response which is analyzed, and on the size and desposition of the decoupled shot. In addition, for some of the body wave modes recorded from a tamped and decoupled shot pair at a single station, the decoupled signal can be approximated by linear filtering of the tamped shot source function. (Author)

AD-261 764 Div. 6, 12, 8
(23 Aug 61) OTS price $3.60

Florence U. (Italy).
MAINTENANCE AND OPERATION OF A DOPPLER DATA RECORDING STATION. PART I: DOPPLER EFFECT MEASUREMENTS.
Final rept. 1 Jan 59-30 Sep 60,
by Pier Francesco Checcacci. Sep 60, 40p. incl. illus. tables.
(Contract AF 61(052)182)
(AFCRL-521)
Unclassified report

DESCRIPTORS: *Radio signals, *Doppler tracking, *Satellite vehicles, *Position finding, Mathematical analysis, *Orbital flight paths, Doppler systems, Radio receivers, Antennas, Tracking, Data processing systems, Frequency meters, *Satellite vehicle trajectories, Measurement, Maintenance, Operation, Italy.

The use of Doppler effect methods for the tracking of the satellites was examined. Some of these methods require hypotheses on the motion of the vehicle and therefore can be employed only for vehicles having inertial motion. Others do not need hypotheses, a priori, on the motion and therefore can be applied to the tracking of propelled vehicles. The methods of the second type appear to assure high accuracy, of the same order as the CW phase measurement systems, presently in use for the tracking of big missiles. The system currently used, that is the Doppler tracking by means of common receivers, though rather primitive, seems to be practical and cheap. Its main feature is that no modification is required for tracking satellites equipped with very different transmitters. On the other hand, a large number of arrangements of the equipment is possible. (Author)

AD-261 885 Div. 6, 30, 12
(24 Aug 61) OTS price $1.60

RCA Defense Electronic Products, Moorestown, N. J.
DIFFERENTIAL CORRECTION TECHNIQUE FOR DETERMINATION OF THE DAMP SHIP LOCATION.
Rept. on Down-Range Anti-Missile Measurement

Program,
by R. D. Bachinsky and B. M. Wolf, 16 Aug 61, 12p. incl. illus. table (DAMP technical monograph no. 61-1)
(Contract DA 36-034-ORD-3144)
(ARPA Order no. 51) Unclassified report

DESCRIPTORS: *Position finding, *Guided missile trajectories, Guided missiles, Surface to surface, *Guided missile tracking systems, Shipborne, *Radar tracking, Taylor's series, Errors, Measurement, Mathematical analysis, Navigation, *Ships, Partial differential equations, Integral equations, Statistical analysis, *Orbital flight paths, *Test facilities, Radar equipment.

A mathematical method is presented for accurately determining the location of a mobile tracking radar, such as the DAMP ship, from observed tracking data on an extra-atmospheric ballistic target whose orbital elements are known. The method assumes that the observed radar data (range, azimuth, and elevation) contain noise which is normally distributed about those values observed by a noise-free and bias-free radar, and are independently distributed. The feasibility of the method was investigated through a series of simulated tests using orbital elements from an actual ballistic missile trajectory. Varying degrees of noise and bias were introduced to determine the effects on the accuracy of locating the mobile radars. (Author)

AD-261 943 Div. 6, 8
(28 Aug 61) OTS price $12.00

Armour Research Foundation, Chicago, Ill.
EVALUATION AND IMPROVEMENT OF RADAR-BEACON SYSTEMS.
Final rept. 10 May 60-30 June 61,
by A. Ashby, S. Kazel, and others. 30 June 61, 165p. incl. illus. table, 28 refs.
(Contract DA 36-039-sc-85318, Proj. 3C16-19-001)
Unclassified report

DESCRIPTORS: *Radar beacons, *Radar tracking, Coding, Sensitivity, Radar duplexers, Ferrites, Crystal detectors, Microwave amplifiers, Amplifiers, *Crystal video receivers, C band, Crystal holders, Impedance matching, Cavity resonators, Diodes, Design, Reliability, Radiofrequency filters, Doppler radar, Signal-to-noise ratio, Radar equipment.

Research efforts were continued on: (1) the improvement in beacon performance when a ferrite circulator is used as the duplexer, (2) the possibility of designing a fixed tuned crystal video detector for the C-band range, (3) the application of parametric amplifiers to radar-beacon receivers, (4) the performance of an experimental C-band parametric amplifier, (5) a 370 mc tunnel diode amplifier, (6) the theory of optimum linear filtering and prediction, as applied to radar tracking systems, and (7) an approximation method for the design of an optimum filter, valid at high signal-to-noise ratios. Previous results comparing the tracking accuracy of pulse and pulse-doppler radars are summarized. (Author)

7. ELECTRICAL EQUIPMENT

AD-261 594 Div. 7
(5 Sep 61) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
AN INVESTIGATION OF THE DYNAMICS OF THE ELECTROLYTE DISTRIBUTION SYSTEM IN THE PS502-502A POWER SUPPLY,
by Glenn L. Scillian and Conant H. Emmons.
24 July 61, 34p. incl. illus. tables (DOFL rept. no. TR-959)
(Proj. nos. 30233 and 77856)
Unclassified report

DESCRIPTORS: *Electrolytic cells, *Power supplies, *Primary batteries, *Wet cells, *Storage batteries, Diaphragms (Mechanics), Failure (Mechanics), Tests, Microphotography, Silver compounds, Oxides, Zinc electrodes, Mechanical properties, Stresses.

The motion of the pumping diaphragm in the electrolyte reservoir of the PS502-502A power supply was studied during its operation by means of transparent models and high-speed motion picture photography. The primary purposes of the investigation were to determine the causes of occasional diaphragm failure that has led to electrical failure of the battery and to find means of eliminating the causes. The failures were found to be due to excessive mechanical stress caused, in turn, by (1) high-pressure shock from the detonating squibs used to release the stored pressurized gas and, (2) improper folding of the diaphragm during activation. Recommendations are given for the improvement of design and performance. (Author)

AD-261 645 Div. 7, 22
(23 Aug 61) OTS price $6.60

Naval Ordnance Lab., White Oak, Md.
LINEAR LUMPED PARAMETER ANALYSIS OF SYNCHROS. VIII. SIMPLE DIFFERENTIAL CONTROL SYSTEMS,
by G. H. Weiss and J. H. Rosenbloom. 10 Dec 53, 58p. incl. illus.
(NAVORD rept. no. 2569) Unclassified report

DESCRIPTORS: *Synchros, *Control systems, *Servomechanisms, Linear systems, Mathematical analysis, Voltage, Impedance, Series, Matrix algebra, Transformations (Mathematics), Fire control, Errors, Perturbation theory.

An analysis is presented of a differential control system. The system consists of a differential in series with a transmitter - transformer combination. The major goal is to express the various properties of the differential system such as voltage gradient, electrical error, and null voltage, in terms of the impedances. (Author)

AD-261 646 Div. 7, 22
(23 Aug 61) OTS price $5.60

Naval Ordnance Lab., White Oak, Md.
LINEAR LUMPED PARAMETER ANALYSIS SYNCHROS. VII. SIMPLE TORQUE SYSTEMS,
by B. D. Fried and J. H. Rosenbloom. 8 July 53, 52p. incl. illus. tables.
(NAVORD rept. no. 2829) Unclassified report

DESCRIPTORS: *Synchros, *Control systems, *Servomechanisms, *Torque, Voltage, Impedance, Fire control, Linear systems, Mathematical analysis, Electrical properties.

Formulae are presented for torque gradient and electrical error of a simple torque system, in terms of the basic building blocks - the impedances. A simple torque system consists of a transmitter and a receiver. For this system two torque gradients are defined: one observed at the

receiver and one observed at the transmitter. Also a unit torque gradient is defined by the specifications. This is measured on an individual synchro independently of any connections into any system. These may turn out to be unequal. Various plausible physical assumptions are introduced from time to time to simplify results. To be specific there are five assumptions and among these are two forms of proportionality for the impedances of two synchros of a system - a weak and a strong form. The following comparisons then hold among the various types of torque gradient: (1) the unit torque gradient is equal to either torque gradient of a simple torque system of identical synchros, and (2) to develop the usual formula for either torque gradient of a simple torque system in terms of the individual unit torque gradients we require the strong form of proportionality and no effective mutual resistance. (Author)

AD-261 647 Div. 7, 22
(23 Aug 61) OTS price $10.10

Naval Ordnance Lab., White Oak, Md.
A HANDBOOK FOR SYNCHRO SYSTEMS,
by George H. Weiss and George L. Beyer, Jr.
16 Dec 53, 114p. incl. illus. tables, 17 refs.
(NAVORD rept. no. 3600) Unclassified report

DESCRIPTORS: *Synchros, *Control systems, *Servomechanisms, Handbooks, Torque, Voltage, Design, Fire control, Mathematical analysis.

A handbook is discussed which is a compilation of formulas, definitions, symbols, and techniques useful in designing and analyzing synchro systems from a linear lumped parameter point of view. In addition to information on specific synchro systems, a method is presented for the analysis of systems by means of models of its components. The designer can, with the aid of these models, analyze more complicated circuits than are presented in this Handbook. Numerous illustrative examples are worked in detail so that the reader can familiarize himself with the method of analysis. Whenever possible results are given in graphic form. Among the topics treated are the effects of loads on system accuracy, torque and voltage gradients, the effects of angular velocity on control system operation, and the measurement of synchro impedances. (Author)

AD-261 648 Div. 7, 22
(23 Aug 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
LINEAR LUMPED PARAMETER ANALYSIS OF SYNCHROS. IX. EFFECTS OF ANGULAR VELOCITY ON A SIMPLE CONTROL SYSTEM,
by George H. Weiss. 8 Feb 54, 20p. incl. illus.
(NAVORD rept. no. 3633) Unclassified report

DESCRIPTORS: *Synchros, *Control systems, *Servomechanisms, Impedance, Transformers, Voltage, Mathematical analysis, Fire control, Design.

An analysis is presented of the output voltage from a control transformer in a simple control system in which the rotors have the same uniform angular velocity relative to the stator windings. The analysis given is by means of the Kron methods used in previous reports in this series, but suitably modified for the present case. The main result given is a formula for the output voltage as a function of impedances, angle of separation, and velocity of rotation. Under the approximation that the transmitter impedance level, is negligible in comparison to the transformer impedance level, the expression for the output voltage is considerably simplified. In particular, the major dependence of output voltage on impedance is on the ratio of the real and imaginary parts of a single transformer impedance. By means of the formula for the output voltage, it is shown in contrast to the stationary case, that the voltage is never zero when the synchros rotate. A formula for the position of the minimum output voltage is also given. Many of the results derived analytically are presented in graphic form. (Author)

AD-261 735 Div. 7, 26
(23 Aug 61) OTS price $1.10

Sprague Electric Co., North Adams, Mass.
INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE BATTERIES.
Quarterly rept. no. 10, 1 Apr-30 June 61,
by S. B. Williams and A. G. Ceely. 30 June 61, 7p. incl. tables.
(Contract DA 36-039-sc-81251)
Unclassified report

DESCRIPTORS: *Electrolytic cells, *Dry cells, *Storage batteries, Production, Quality control, Test methods, Tests, Temperature, Manufacturing methods, Electrolytes, Solids.

Qualification testing was successfully completed on 60 pre-production batteries. Thirty of the units were stored for 90 days at room temperature followed by 30 days of storage at 155 F. The other 30 units were stored for 30 days at 155 F. Each group was divided into half, one half being subjected to capacitor duty cycling at -25 F and the other half to duty cycling at 125 F.

AD-261 841 Div. 7, 4, 25
(24 Aug 61) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
CHEMICAL CONVERSION OF WASTE HEAT TO ELECTRICAL ENERGY.
Quarterly rept. no. 4, 1 Apr-30 June 61,
by C. Roland McCully. 10 July 61, 29p. incl. illus. tables (Rept. no. ARF 3182-4)
(Contract NOw 60-0760-c)
Unclassified report

DESCRIPTORS: *Power supplies, *Electrolytic cells, Anodes (Electrolytic cells), Cathodes (Electrolytic cells), Materials, Salts, Halides, Solids, Melting, Antimony compounds, Copper compounds, Electric potential, Lead compounds, Chlorides, Electrolytes, Electrical conductance, Density, Tellurium compounds, Tin compounds, *Heat, *Electricity, Electrochemistry, Chemical reactions.

Results with galvanic cells of molten salts continued to be favorable. The CuCl-CuCl2 couple was found to afford a useful cathode for such anode couples as SnCl2-SnCl4, HgCl-HgCl2, and TeCl2-TeCl4. The CuCl-CuCl2 couple was found to approximate the potential of the SbCl3-SbCl5 couple. Research continued on the physical properties of molten salt mixtures and on the effects of component concentrations on the emf of galvanic cells. Thermal regeneration of anode

materials centered on conversion of SnCl4 to SnCl2 and TeCl4 to TeCl2, with recovery of Cl2 in both cases. The former reaction occurred at 1700 K and the latter at 950 K. The relationship of current to chemical concentration and effect of circulation on cell current were both established with cells of CuCl-CuCl2 cathodes and SnCl2-SnCl4 anodes. Current densities of 45 and 33 ma/sq cm with and without circulation, respectively, were attained at E to the 1/2 power; the densities were limited by the thickness of the electrolyte. Studies on solid electrolytes centered on PbCl2 and PbF2 and on the effect of adding KF, CsCl, and CdF2. (Author)

AD-261 905 Div. 7
(24 Aug 61) OTS price $1.00

Flight Accessories Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
SECOND STATUS REPORT ON THERMIONICS.
by N. N. Noe and O. P. Breaux. Jan 61, 34p. 33 refs.
(WADC TN 59-355, pt. 2) Unclassified report

DESCRIPTORS: *Thermionic emission, *Power supplies, *Bibliography, Cesium, Vapors, Solar energy, Diodes, Space environmental conditions, Plasma physics, Thermocouples, Vacuum systems, Design, Scientific research, *Solar cells, Generators.

A complete list of governmental contracts, as far as is known, covering work on thermionic energy conversion is given as well as a summary of work accomplished under those contracts for which information has been obtained. A bibliography denoting articles on thermionic energy conversion is also included. (Author)

AD-261 960 Div. 7, 8
(29 Aug 61) OTS price $5.60

American Machine and Foundry Co., Alexandria, Va.
ULTRATHERMIC CAPACITOR,
Rept. for Jan 58-Dec 60,
by C. W. H. Barnett. Mar 61, 47p. incl. illus. tables.
(Contract AF 33(616)5422)
(WADD TR 61-50) Unclassified report

DESCRIPTORS: *Capacitors, *Ceramic capacitors, *Subminiature electrical equipment, Subminiature electronic equipment, Nuclear propulsion, Aircraft, Radioactivity, Dielectric films, Flame spraying, Plasma jets, Electrodes, Aluminum, Foils, Design, Tests, Life expectancy, Electrical properties, Temperature, Pressure, Vibration, Shock, Acceleration.

The design of a capacitor capable of operation at 500 C and in nuclear radiation is presented. This design is the result of the development of processes of spraying dielectric material by use of oxyacetylene-flame spraying and spraying by means of a plasma jet. The processes led to the development of 2 types of capacitors, namely, the monolithic and the rolled-tape types. The monolithic type of capacitor was produced by spraying alternate layers of electrode and dielectric material on a rotating ceramic core. The tape capacitor was made by spraying dielectric material on an aluminum-foil tape and then rolling 2 of these tapes to form a conventional rolled-type of capacitor. Tests established that, considering the temperature and radiation requirements, aluminum and alumina are the best materials for fabricating this type of component. Two sizes of unit were designed, a small unit having the design goal of .001 to .01 microfarad and a larger unit with the design goal of 0.1 to 1.0 microfarad. The development phase showed that the design goal is realistic and also confirmed that a program for the production of an ultrathermic capacitor is feasible. (Author)

AD-262 008 Div. 7, 8
(25 Aug 61) OTS price $3.60

Ray-O-Vac Co., Madison, Wis.
DEVELOPMENT OF A LIGHTWEIGHT, WATER-ACTIVATED BATTERY FOR A SUPERHET RADIOSONDE.
Final rept. 1 July 59-30 July 60,
by Harold N. Honer. 30 July 60, 34p. incl. illus.
(Contract DA 36-039-sc-84523)
Unclassified report

DESCRIPTORS: Radiosondes, *Power supplies, Design, *Water activated batteries, Production.

A program was set up to develop a lighweight, water-activated battery for a Superhet radiosonde. Experience obtained from the fulfillment of production contracts of similar battery packs was utilized to arrive at a battery having the required capacity, and possessing a reliable construction at a reasonable cost. The final design was a battery pack 2-1/2 in. in height, 6-7/16 in. long and 4-11/16 in. wide weighing approximately 560 g dry and 875 g activated. Average capacities are 188 min at moderate temperature, 207 min at low and high-low temperature tests. (Author)

AD-262 063 Div. 7, 20
(29 Aug 61) OTS price $6.60

Mallory, P. R., and Co., Indianapolis, Ind.
RESISTORS, FIXED, PRECISION HIGH TEMPERATURE, RADIATION RESISTANT.
Rept. for 1 Mar 59-30 June 60, on Improved Electronic Components,
by R. A. Najmon. Apr 60, 56p. incl. illus. tables.
(Contract AF 33(616)6164; Continuation of Contract AF 33(616)3643)
(WADD TR 60-801) Unclassified report

DESCRIPTORS: *Fixed resistors, Resistors, Radiation damage, Temperature, Films, Tin, Antimony, Oxides, Additives, Resistance, Flame spraying, Coatings, Preparation, Design, Tests, Life expectancy, Stability, Reliability.

The development of precision high temperature metal oxide film resistors suitable for operation at temperatures between -65 C and 500 C in nuclear environments for 1000 hours is discussed. Work on metal oxide film resistors indicated that stable resistive films could be obtained by depositing a tin oxide-antimony oxide film on high alumina substrates. This tin-antimony film was modified by the addition of organic or metallic additives to determine the effect of such additives. Other high alumina substrate materials were investigated, together with methods of cleaning the substrate materials prior to film deposition, to determine the best material for the preparation of stable resistors. An improved method of applying the flame-sprayed alumina protective coating was developed to minimize variations in the resistance resulting from the application of the coating. Extended load-life tests were made to evaluate the effects of changes in resistor preparation and also to evaluate the resistors as finally developed. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-262 131 Div. 7, 8
(29 Aug 61) OTS price $5.60

Temco Electronics, Dallas, Tex.
INVESTIGATION OF SILICON CONTROLLED RECTIFIERS FOR STATIC POWER CONVERSION.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, by G. P. Underbrink. 10 May 61, 55p. incl. illus. 21 refs. (Rept. no. TER 611-1907)
(Contract DA 36-039-sc-85381)
Unclassified report

DESCRIPTORS: Silicon, *Rectifiers, Power supplies, Inverter circuits, Direct current, Power transformers, Electrical equipment, Electric currents, Radio interference, Reduction, Commutators, Oscillator circuits, Electronic circuits, Radiofrequency filters, Design, Tests, Mathematical analysis.

The analysis and method of applying silicon controlled rectifiers (SCRs) to one kilowatt DC to DC power converters are presented. A study method of optimum frequency for DC converter transformers was developed. The effects of frequency upon over-all converter weight and efficiency is also discussed. Requirements are analyzed for a 1200-watt, 1600-volt DC power converter which uses SCRs. The resultant design of this converter is presented. RF interference-free design techniques for static power devices are appended. (Author)

AD-262 136 Div. 7, 12
(29 Aug 61) OTS price $5.60

Space Technology Labs., Inc., Los Angeles, Calif.
CONTROL SYSTEMS STUDIES.
Final rept. 1 July 60-30 June 61, by Robert E. King. 30 June 61, 51p. incl. illus. tables, 34 refs. (Rept. no. 7203-0005-RU-000)
(Contract AF 04(647)619)
(AFBMD TN 61-4) Unclassified report

DESCRIPTORS: *Control systems, *Servo systems, Circuits, Semiconductors, Reliability, Automatic pilots, Guided missiles, Surface-to-surface, Gyroscopes, Test equipment, Digital systems, Trigger circuits, Electronic circuits, Triggered gates, Digital computers, Tests.

Progress is reported on research covering the following areas: (1) advanced circuit studies; (2) control sensor studies; and (3) power servo studies. The section on advanced circuit studies describes the development and testing of circuitry suitable for an advanced high performance control system (Test Vehicle No. 2), the development of techniques for increasing circuit reliability and the application of advanced semiconductor devices to control system circuitry. The control sensor studies consist of an evaluation of the performance of a wide angle MIG gyro. In addition, the measurement of the characteristics of a special model of this gyro incorporating a spin motor rotation detector (SMRD) is described. Power servo studies consisted of an evaluation of a hot gas servo actuator under simulated load conditions. (Author)

AD-262 177 Div. 7
(31 Aug 61) OTS price $10.10

Electronics Research Lab., U. of Calif., Berkeley.
BANG BANG CONTROL OF REAL POLE SYSTEMS,
by Michael Athanassiades. 15 June 61, 126p. incl. illus. table, 22 refs. (Series no. 60; Issue no. 377)
Unclassified report

DESCRIPTORS: *Control systems, *Servo systems, Tracking, Nonlinear systems, Errors, Reduction, Series, Mathematical analysis, Matrix algebra, Matrix calculus, Operators (Mathematics), Differential equations, Switching circuits, Guidance, Trigger circuits, Cybernetics, Numerical methods and procedures.

The control equations, for minimum response time operation, are presented for regulatory and tracking systems. The controlled plant is linear, time-invariant, with real, non-positive poles. The input to the plant is assumed amplitude saturated. The concept of the switching hypersurface leads to a system of nonlinear algebraic equations, which must be solved by the compensator. The optimal system is analyzed through its trajectories in phase space which define the switching sets. Minimum response time implies the reduction of the error and its time derivatives to zero in minimum time. A sequence of switching sets and a switching hypersurface are defined in space. It is shown that the switching sets provide the unique, and optimal, path for the system trajectories. A distance function is defined, which indicates the relative position of the state point with respect to the switching hypersurface. To determine the distance function a compensator must solve a system of N-1 nonlinear algebraic equations, where N is the order of the plant. (Author)

AD-262 262 Div. 7, 14
(16 Aug 61) OTS price $1.60

Westinghouse Electric Corp., Pittsburgh, Pa.
INORGANIC BINDERS FOR C CORES.
Progress rept. no. 1, 1 Dec 60-29 June 61, by J. Seidel. 27 July 61, 15p. incl. illus.
(Contract NObsr-85304)
Unclassified report

DESCRIPTORS: *Magnetic cores, *Binders, *Ceramic coatings, Silicon coatings, *Magnetic materials, Viscosity, Thermal expansion, Glass, Steel, Surfaces, Silicon compounds, Titanium compounds, Zirconium compounds, Sodium compounds, Calcium compounds, Rubidium compounds, Oxides, Ceramic materials, Manufacturing methods, Films, Thin films, Inorganic substances, Silicon alloys.

Cores are constructed by applying a thin glassy layer to magnetic steel strip and winding the composite until the required build-up is attained. The final laminar bond between adjacent glassy layers is accomplished by heat treatment at the softening temperature of the glass. The hot-winding method for obtaining the laminar bond did not eliminate the need for stress relief annealing. The cold-winding method proposed is just as effective in obtaining the laminar bond, providing the softening temperature of the glass coincides with the requisite stress relief annealing temperature. A viscosity of approximately 10 to the 8th power poises at 810 C is required for glassy binders used in cold-wound cores. For a stress-free core, the binder is also required to match the thermal expansivity of the magnetic material. The coefficient of thermal expansion for grain-oriented silicon

steel is approximately 13.5 x 10 to the 6th power. The difficulty in obtaining a glass composition which would satisfy both high viscosity and high thermal expansivity is discussed. The system, Na2O.xRO2.(3-x)SiO2 (where R is Zr or Ti) and Rb2O-CaO-SiO2, are being studied for the development of a suitable binder. The importance of surface condition of the magnetic material and binder slip consistency is discussed. (Author)

AD-262 298 Div. 7, 26
(31 Aug 61) OTS price $6.60

Metallized Products Co., Inc., Norwalk, Conn.
INDUSTRIAL PREPAREDNESS MEASURE 0.00017'' METALLIZED CONDENSER PAPER.
Final rept.,
by Clark E. Taylor. 19 July 61, 1v. incl. tables.
(Contract DA 36-039-sc-75984)

Unclassified report

DESCRIPTORS: *Paper capacitors, Paper, Capacitors, Processing, *Manufacturing methods, Thickness, Varnishes, Dehydration, Production, Tests, Design, Wood pulp, Dieletrics, Life expectancy.

Kraft 0.00017 inch condenser tissue was successfully processed from 2 kinds of pulp through to metallized capacitors and appraised by capacitor qualification tests designed for a thicker dielectric as well as to the relative merits of the 2 pulps. Qualification testing showed a production yield of 60% and a life test failure rate of 10%. Pulp comparison did not detect any significant difference between Canadian and Swedish pulps. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-261 516 Div. 8, 25
(21 Aug 61) OTS price $8.60

Cornell U., School of Electrical Engineering, Ithaca, N. Y.
A THEORY OF NOISY TWO-PORT NETWORKS.
Technical rept. no. 5 on Microwave Noise, by K. R. Kleckner. 15 May 61, 97p. incl. illus. 19 refs. (Research rept. no. EE 496)
(Contract DA 36-039-sc-84524)
Unclassified report

DESCRIPTORS: *Electrical networks, Noise generators, Linear systems, Electrical properties, Matrix algebra, Sources, Integral transforms, *Signal-to-noise ratio, Electronic circuits, Mathematical analysis, *Communications theory, Microwave networks, Theory, Admittance, Impedance, Statistical functions, Measurement, Errors, Simulation, *Communication systems.

In order to overcome the lack of specific information about the noise properties of active elements, a study of noisy electrical networks is presented, which uses a model that describes the total network noise by means of equivalent noise generators at the several accessible terminal-pairs. The parameters of the generators are shown to be obtainable by measurements performed at these terminal pairs. Both time- and frequency-domain representations are given. A frequency-domain correlation function is introduced, which is shown to provide a complete description of the correlation between equivalent noise generators, and an experimental procedure for determining this function is presented. Two performance criteria for assessing the degree to which noise disturbs the desired operation of a network are discussed. The noise measure, which is related to the conventional noise figure, is shown to be a useful gauge of network performance when the applied input signal is not noisy. Minimizing the noise measure at each frequency of a frequency band is not always possible, so that its use is restricted to single-frequency amplifiers. Use of the mean-square error of the network as a performance criterion is discussed. (Author)

AD-261 522 Div. 8, 30
(21 Aug 61) OTS price $6.60

CBS Labs., Stamford, Conn.
HIGH EFFICIENCY TRANSISTOR STRUCTURES.
Quarterly progress rept. no. 1, Jan-Mar 61, by M. Schuller. 20 Apr 61, 71p. incl. illus. tables (Rept. no. CLD 156)
(Contract DA 36-039-sc-87379)
Unclassified report

DESCRIPTORS: *Transistors, Electronic switches, *Switching circuits, Electronic circuits, *Computers, Impurities, Crystals, *Miniature electronic equipment, Theory, Design, Electrical properties, Diodes, Semiconductors, Partial differential equations, Silicon, Physical properties.

Efforts are concerned with providing the military with reliable switching transistors which operate at such low power levels that they reduce the over-all power consumption of computer systems by at least one order of magnitude and allow a much higher packing density of components because of the reduced power dissipation. High efficiency of transistor circuitry at very low power levels is one of the crucial prerequisites for successful systems miniaturization. Based on the knowledge of the behavior of pn-junctions at low current densities and voltages the dc parameters of the transistor and their dependence on geometry, doping and crystal imperfection were derived. The switching speed of the transistor at low power levels is discussed. By controlling the crystal imperfections and pushing the dimensions of the transistor to the utmost limit, switching times of lower than 10 to the -6th power sec at micron watt level are feasible in specially designed switching circuits. (Author)

AD-261 577 Div. 8
(21 Aug 61) OTS price $6.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
ELECTRON TUBE RESEARCH.
Quarterly progress rept. no. 6, 1 Mar-31 May 61, by N. DeClaris. 31 May 61, 158p. incl. illus. (Research rept. no. EE 502; Rept. no. 10)
(Contract DA 36-039-sc-85272; continuation of Contract DA 36-039-sc-78238)
Unclassified report

DESCRIPTORS: *Electron tubes, *Electronic circuits, Synthesis, Functions, Radiofreqeuncy filters, Integral transforms, Radiofrequency amplifiers, Numerical analysis, Linear systems, Impedance, Broadband, Amplifiers, *Distributed amplifiers, Design, Tests, Mathematical analysis, Lattices, Admittance.

This rept. includes: AD-259 908
WIDE-BAND AMPLIFIERS FOUR-OPORT ACTIVE DEVICES, by J. J. Golembeski. 1 Feb 61, 63p. incl. illus. (Research rept. no. EE 489; Technical rept. no. 62) (Contract DA 36-039-sc-85272)

A realization method is given for driving-point and transfer functions, which results in active networks containing transconductance-type controlled sources. An active unbalanced structure is also investigated for possible applications in synthesis. A survey of active filters, both fixed and variable, is made and a selected bibliography is presented. The link connection is examined as a basic configuration for the synthesis of active networks whose impulse response will be a function of a variable parameter x. It is shown that if a time-varying linear system is stable, the real part and the imaginary part of the network function along the frequency axes are uniquely related to each other by a Hilbert transformation. A link amplifier structure with voltage-variable transconductances is proposed as an adaptive matched filter. A method is given whereby a set of signals of equal power and fixed time-bandwidth product can be constructed, such that there is a minimum of ambiguity between the signals. (Author)

AD-261 600 Div. 8, 26
(21 Aug 61) OTS price $1.60

Microwave Associates, Inc., Burlington, Mass.
VARACTOR DIODE INDUSTRIAL PREPAREDNESS MEASURES.
Quarterly progress rept. no. 4, 25 Mar-24 June 61.
24 June 61, 20p. incl. illus.
(Contract DA 36-039-sc-85941)
Unclassified report

DESCRIPTORS: *Diodes, *Variable capacitors, Microwave equipment, Silicon, Industrial production, Manufacturing methods, Production, Realiability.

This effort concerns the design of an improved varactor adjustor. The semi-automation and the improved reliability is explained in detail. The actual history of the change from a hand-cranked type adjusting-jig, to the present model, along with plans for future automation are also explained in detail. The details discussed will indicate that the present varactor adjust process is more reliable at a more statisfactory output. (Author)

AD-261 601 Div. 8, 25
(21 Aug 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DETERMINATION OF MAGNETOELASTIC COUPLING BY SPIN WAVE RESONANCE,
by M. H. Seavey, Jr., 31 July 61, 24p. incl. illus. table (Rept. no. 82G-0029)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Standing wave ratios, Phonons, Magnetic fields, *Electromagnetic theory, Electric fields, Microwave frequency, Relaxation time, Propagation, Electromagnetic waves, *Solid state physics, Resonance, Elasticity, Mathematical analysis, *Thin films, Resonance absorption, Magnetostriction, Magnetostrictive resonators.

An electromagnetic theory of spin wave resonance in the presence of magnon-phonon coupling is given. Expressions for the propagation constants and power absorption in a thin film as functions of dc magnetic field are obtained. The results are shown to establish the feasibility of using the above method to determine the magnetoelastic coupling coefficient at microwave frequencies. (Author)

AD-261 653 Div. 8
(22 Aug 61) OTS price $1.10

Nevis Cyclotron Labs., Columbia U., Irvington-on-Hudson, N. Y.
A TUNNEL DIODE NANOSECOND COINCIDENCE CIRCUIT,
by Paolo Franzini. July 61, 3p. illus. (Rept. no. NEVIS-95; R-297; CU-202)
(Contract Nonr-26672; Continuation of Contract N6ori-110, T. O. 1)
Unclassified report

DESCRIPTORS: *Diodes, *Switching circuits, Circuits, Coincidence counting, Electron tubes, Design, Electronic circuits, Silicon, Germanium.

A fast coincidence circuit using tunnel diodes is described. A resolving time of 3 nanoseconds was obtained during a recent experiment. In ideal conditions, resolving times as low as 0.5 ns have been measured. The same circuit can also be used - with minor modifications - as an anticoincidence whose total dead-time can be as low as 5 ns. This AND circuit has the following advantages over the usual diode AND circuits: (1) discrimination on the input pulses; (2) limiting of the input pulse amplitudes; (3) the switching speeds of the components are no limitation to the resolving time compared to the rise times of pulses from any presently available phototubes; and (4) large ratio of the amplitude of the coincidence signals to feed-thrus. (Author)

AD-261 660 Div. 8
(22 Aug 61) OTS price $6.60

Clevite Corp., Cleveland, Ohio.
LOW FREQUENCY GYRATOR DEVELOPMENT,
by D. R. Curran, C. P. Germano, and J. H. Silverman. 20 June 61, 61p. incl. illus. tables (Technical note no. 2)
(Contract AF 30(602)2202)
(RADC TN 61-149) Unclassified report

DESCRIPTORS: Band-pass filters, Synthesis, Magnetostrictive elements, Ferrites, Design, Piezoelectric materials, Broadband, Transducers, Electromechanical converters, *Piezoelectric transducers, *Magnetostriction transducers, *Electronic circuits, Electrical networks, Impedance, Tests, Theory, Magnetic fields, Electric fields, *Transmission lines.

Network synthesis of series and parallel neutralizing networks is described and results presented. Effect of these networks on pass direction insertion loss is examined theoretically. An efficient isolator, with a narrow band of rejection in the stop direction and low insertion loss in the pass direction, is achieved by adding a single reactance in parallel or series with the EM gyrator. EM gyrators, each consisting of a magnetostrictive ferrite plate bonded to a piezoelectric plate, were designed using composite beam theory. These structures perform well in both flexural and longitudinal modes, and hence cover a wide frequency range. In both cases, signal take-off from the magnetostrictive bar is effected by a coil wrapped either around the ferrite (before bonding) or around the composite structure. Optimum bias for the ferrite is provided by strategic location of a permanent magnetic. A second type of EM gyrator, consisting of an electrodynamic transducer coupled to a piezoelectric Bimorph, was investigated and found to be far less efficient than the piezoelectric-piezomagnetic system. (Author)

AD-261 672 Div. 8
(22 Aug 61) OTS price $2.60

Hughes Aircraft Co., Culver City, Calif.
STUDY OF LOW-NOISE MICROWAVE TUBES. NEW APPROACHES TO THE LOW-NOISE PROBLEM.
Quarterly rept. no. 4, 15 Mar-14 June 61, on A Study of the Problem of Noise on Electron Beams,
by M. R. Currie, D. C. Forster, and J. W. Hansen. 14 June 61, 24p. incl. illus.
(Contract DA 36-039-sc-85354)
Unclassified report

DESCRIPTORS: *Microwave equipment, *Electron tubes, Noise (Radar), Noise (Radio), Reduction, Electron beams, S band, *Electron guns, Cathodes (Electron tubes), Diodes, Theory, Design, Anodes (Electron tubes), Magnetic fields, Measurement.

Introducing a multivelocity region by depressing the potential of a low-noise electron beam which is first accelerated to a monoenergetic condition was investigated experimentally. No reduction in beam noisiness was observed. It was found that the formation of a virtual cathode in the monoenergetic region increases beam noisiness. An experiment is discussed in which the multivelocity region of the diode of a low-noise gun is extended beyond that of the conventional low-noise gun. The first experimental tube incorporating this feature produced encouraging results even though cathode emission was weak. Evidence of the extension of the low velocity drift region was obtained. (Author)

AD-261 730 Div. 8
(22 Aug 61) OTS price $2.60

Philco Corp., Blue Bell, Pa.
BASIC STUDY INTO THE MECHANISM OF THE MgO-TYPE COLD CATHODE EMISSION.
Semi-annual rept. no. 2, 15 Dec 60-15 June 61, by R. Johannes and K. Ramanathan. 28 June 61, 28p.
(Contract DA 36-039-sc-85345)
Unclassified report

DESCRIPTORS: *Cold cathode tubes, Electron tubes, *Cathodes (Electron tubes), *Oxide cathodes, Magnesium compounds, Oxides, *Diodes, Admittance, Secondary emission, Coatings, Metallic compounds, Quantum mechanics, Theory, Design, Measurement.

Efforts were continued on the working model of an MgO cold cathode. No basic changes were made in this model, but consideration of details of the processes involved led to good agreement with additional experimental evidence that became available. The most useful additional experimental evidence came from ac admittance characteristics of MgO diodes as a function of frequency and average tube current. Reasons are given for believing that further experiments would be helpful in clarifying certain details of the theoretical model. (Author)

AD-261 734 Div. 8
(22 Aug 61) OTS price $2.60

RCA Defense Electronic Products, New York.
THE TUNNEL DIODE AS A NONRECIPROCAL CIRCUIT ELEMENT,
by D. Fleri and H. Boyet. Apr 61, 19p. incl. illus. (Rept. no. CR-61-419-7)
(Contract AF 30(602)2184)
(RADC TN 61-156) Unclassified report

DESCRIPTORS: *Diodes, Electronic circuits, Theory, *Phase shifters, Frequency shift converters, *Transmission lines, Broadband, Impedance matching, Noise (Radio), Amplifiers, Waveguide couplers, Wave transmission, Electron tubes, Mathematical analysis.

A theoretical investigation is presented of the possibility of utilizing the tunnel diode in the design of nonreciprocal transmission networks such as the isolator and circulator at frequencies not amenable to ferromagnetic techniques. The tunnel diode frequency converter exhibits broad band nonreciprocal phase shift properties. A circuit configuration is described which achieves nonreciprocal action by means of two 3 db couplers connected by 2 transmission line sections. In one of these sections a cascaded tunnel diode up-converter-down-converter arrangement is used to provide nonreciprocal phase shift. It is shown that matching the converter arrangement to the hybrid ports precludes lossless operation. The conversion loss may be maintained low by proper selection of diode and transmission line parameters. However, such a selection of parameters results in extremely high noise figure for each converter stage. (Author)

AD-261 736 Div. 8, 26
(23 Aug 61) OTS price $3.60

Sylvania Electric Products, Inc., Woburn, Mass.
MICROMINIATURIZED PACKAGING OF 2N384 AND 2N697.
Quarterly rept. no. 3, 1 Apr-30 June 61, by L. Epstein, C. Lawrenson, and J. McManus. 30 June 61, 36p. incl. illus. tables.
(Contract DA 36-039-sc-85377)
Unclassified report

DESCRIPTORS: *Transistors, Germanium, Silicon, *Packaging, Design, *Subminiature electronic equipment, Manufacturing methods, Tests, Life expectancy, Reliability, Shock resistance, Vibration, Production.

Research was continued on the microminiaturized packaging of transistors. Processes and designs were successfully demonstrated for mounting a 2N384 type transistor on an 0.250 inch O.D. hermetic package. Technical problems restricting shock performance for this device were solved. Attempts to use epitaxial devices in the development models of the 2N696-7 device disclosed difficulties. The manufacture of development models with non-epitaxial dice has started.

AD-261 743 Div. 8, 25
(22 Aug 61) OTS price $7.60

Stanford Research Inst., Menlo Park, Calif.
STUDY OF EFFECTS AND CONTROL OF SURFACE CONTAMINANTS ON ELECTRICAL MATERIALS.
Final rept., 15 Feb 60-15 May 61, by Saul W. Chaikin. 10 June 61, 79p. incl. illus. tables, 34 refs. (Rept. no. 6)
(Contract DA 36-039-sc-85274, SRI Proj. PU-3145)
Unclassified report

DESCRIPTORS: Electrical equipment, *Sliding contacts, Surfaces, Contamination, Deposits, Organic compounds, Hydrocarbons, Vapors, Fluorocarbons, Conductors, *Electric relays, Electric insulation, Polymers, Cleaning, Gold, Gold alloys, Palladium, Silver, Electron microscopy, Electronic equipment, Electric connectors.

The cause of objectionable contact resistance was studied in relay contacts used in millivoltmicroampere switching. Organic deposits form spontaneously on noble metal contact surfaces. Deposits formed over a period of weeks or months from a number of pure organic compounds and, as well, from rosin flux and from Teflon and Kel-F. Insulating deposits were detected with a fine wire probe and with the electron microscope. Frictional polymer, formed when metals are rubbed together in an organic environment developed from outgassing rosin flux and Teflon and Kel-F. Four metals were found to generate decreasing amounts of frictional polymer in the order: Pd, Au-alloy, Au, Ag, with the following approximate activity ratios: 100, 10, 2, 0.1. A non-destructive relay test for contact contamination was developed based on monitoring at dry circuit load levels and a contact resistance sensitivity of 0.1 ohm. The relays were put through a 7-step schedule in which time, temperature, and relay cycling were varied. (Author)

AD-261 755 Div. 8, 2
(23 Aug 61) OTS price $11.00

Air Force Cambridge Research Labs., Bedford, Mass.
STUDIES AND MEASUREMENTS MADE OF THE SOLAR ECLIPSE OF OCTOBER 2, 1959,
comp. by Jules Aarons. Apr 61, 148p. incl. illus. table (AFCRL-158)
Unclassified report

DESCRIPTORS: *Solar eclipses, *Radio astronomy, Radio signals, Reflection, Measurement, Moon, Propagation, Wave transmission, Tables, Ionospheric propagation, Bibliography.

Many types of measurements of radio astronomical and upper atmosphere parameters were taken during

the total eclipse of October 2, 1959. Results include data on the uneclipsed solar energy as a function of time, the effect of the eclipse on the formation of the F layer, the diameter of solar plage regions, coherence of tropospheric scientillations and absorption of the D layer. Observations were made of Sputnik III thru a partially eclipsed ionosphere, of moon reflections of 220 Mcps transmissions, as well as other propagation parameters. A bibliography on solar radio observations of eclipses is included. (Author)

AD-261 761 Div. 8, 26
(23 Aug 61) OTS price $6.60

Bell Telephone Labs., Inc., Whippany, N. J.
DEVELOPMENT OF PRODUCTION PROCESSES AND TECHNIQUES FOR L1951 COAXIAL MAGNETRON.
Final technical engineering rept., 9 Sep 57-19 Sep 60.
by S. O. Ekstrand. June 61, 65p. incl. illus. tables.
(Contract AF 33(600)35599)
(ASD TR 61-7-592) Unclassified report

DESCRIPTORS: *Magnetrons, Electron tubes, *Manufacturing methods, Production, Design, Electrical properties, Mechanical properties, Costs, Tests, Life expectancy, Reliability, Test equipment, *Radiofrequency generators, Microwaves, Cavity resonators, Microwave oscillators, K band, Frequency stabilizers.

The refinement for production of the L1951 coaxial magnetron resulted in the full realization of the excellent performance capabilities of its novel design principle. A pilot production line was established and operated to produce these magnetrons at the rate of 2 per day at an over-all yield of 66%. Fifty-four tubes were constructed on the pilot line and met all the performance requirements. Nine tubes were life tested, resulting in an average life in excess of 500 hours. (Author)

AD-261 763 Div. 8, 25
(23 Aug 61) OTS price $1.60

Florence U. (Italy).
RESEARCH ON ELECTROMAGNETIC THEORY.
Final rept. 1 Apr 58-28 Feb 61,
by G. Toraldo di Francia, G. C. Casini and others.
Mar 61, 19p. 12 refs.
(Contract AF 61(052)67)
(AFCRL-525) Unclassified report

DESCRIPTORS: *Electromagnetic theory, Electromagnetic waves, *Microwaves, *Optics, Electromagnetic lenses, Lens antennas, Diffraction, Diffraction gratings, Waveguides, Propagation, Cerenkov radiation, Tests, Test equipment, Scattering, Italy, *Wave transmission.

Contents:
Research on microwave optics and on mechanical actions of electromagnetic waves
Microwave optics
A class of perfect systems for microwave optics
Stepped zone mirror for microwaves
A new microwave lens
Mechanical actions of electromagnetic waves
Diffraction of electromagnetic waves by plane screens with directional conductivity
Angular momentum of an electromagnetic wave in a waveguide
Research on wave propagation in media with complex dielectric constant
Cerenkovian effects and their applications to the production of electromagnetic radiation

AD-261 765 Div. 8
(23 Aug 61) OTS price $2.60

Technical U., Copenhagen (Denmark).
GROUND WIRE SYSTEMS FOR LOW FREQUENCY ANTENNAS.
Final rept.,
by Tove Larsen. Dec 60, 14p. illus. 15 refs.
(Contract AF 61(052)319)
(AFCRL-527) Unclassified report

DESCRIPTORS: *Antennas, *Wire, Antenna hardware, Antenna radiation patterns, Magnetic fields, Installation, Design, Costs, Electric fields, Electromagnetic waves, Mathematical analysis, *Electromagnetic theory, *Electromagnetic fields, Low frequency.

Investigations were concerned with the E-field-losses of ground wire systems. A general theoretical and numerical investigation of the ratio between the E-field-losses and the more commonly known H-field-losses was performed, and the results were used in studies of the losses around various simple vertical monopole antennas with radial ground wire systems. To provide a suitable background for the use of formulas of parallel wire grids in the investigations of ground wire systems, a survey of the development of the theory of wire grids is given. Design charts are given aimed at determining the economical optimum distance between the wires of a ground wire system when E-field-losses, as well as H-field-losses, are taken into account. (Author)

AD-261 777 Div. 8, 25
(22 Aug 61) OTS price $21.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROCEEDINGS OF CONFERENCE ON MICROWAVE ELECTRONICS (Trudy Konferentsii Po Elektronike Svch),
by I. S. Dzhigit and Ye. G. Solov'yev. 27 Feb 61, 358p. incl. illus. tables (Trans. no. MCL-761 of Gosudarstvennoye Energeticheskoye Izdatel'stvo, Moscow, 272p., 1959)
Unclassified report

DESCRIPTORS: USSR, *Traveling wave tubes, Helixes, *Electron beams, Propagation, *Waveguides, Mathematical analysis, *Delay lines, Electromagnetic waves, Microwave equipment, Impedance, Coupling circuits, *Klystrons, *Amplifiers, *Magnetic fields, Focusing, Theory, *Electrostatic fields, *Microwave amplifiers, Space charges, Electric fields, Dielectrics, *Transmission lines, *Radiofrequency filters, *Reflex klystrons, Electrodes, Backward wave oscillators, *Cathodes, Thermionic emission, *Oxide cathodes, Electron tubes.

This symposium is a number of reports on the most pressing problems of microwave electronics read by the authors at the conference on electronics in Moscow in 1957. The conference was convened by the All-Union Scientific Council on Radio Physics and Radio Engineering AN SSSR conjointly with the Bureau of New Techniques MO SSSR. The reports discuss problems of theory and calculation of delay systems for traveling-wave tubes and backward-wave tubes, certain phenomena in a cylindrical electron beam in a uniform magnetic field, focusing of long beams by means of periodic magnetic and electrostatic fields, certain problems of electron optics of the reflex klystron, a description of modern types of cathode for microwave devices, etc. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-261 800 Div. 8, 30
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATION OF AN INFRALOW-FREQUENCY GENERATOR,
by Yu. L. Kurkin, N. S. Kurkina and others.
27 July 61, 11p. incl. illus. (Trans. no. MCL-988 of Izmeritel'naya Tekhnika 1:32-35, 1961)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Signal generators, Automatic, Control systems, Feedback, Servo systems, Errors, Moments, Friction, Voltage.

The investigations conducted have shown that an ILF (infralow frequency) electromechanical generator makes it possible to produce 2 sinusoidal voltages with a 90 degree phase shift. The error of the phase-angle between these 2 voltages does not exceed + or - 0.2%; the range of the generated frequencies is 0.01-1 C the frequency instability is not more than + or - 0.2%; the maximum amplitude of the output voltage is 100 v; the amplitude instability is not more than + or - 0.3%; the nonlinear-distortion factor does not exceed + or - 0.5%; the maximum S/N and induction at the output in the dynamic regime does not exceed 300 mv. The generator completely satisfies the requirements placed on precision measuring generators in the infralow-frequency range. (Author)

AD-261 801 Div. 8, 20, 30
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AN IMPORTANT MEANS OF AUTOMATION,
by N. Yegorov, E. Ivanov, and G. Kochenov.
27 July 61, 5p. (Trans. no. MCL-992 of Ekonomicheskaya Gazeta, p. 3, 12 Feb 61)
Unclassified report

DESCRIPTORS: *Automation, *Electronics, Manufacturing methods, *Radioactivity, *Electronic equipment, *Production, Radioactive isotopes, Computers, Design, Scientific research, Automatic.

AD-261 811 Div. 8, 2
(22 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
REFRACTION OSCILLATIONS OF RADIO WAVES EMITTED BY THE SUN,
by B. M. Chikhachev. 27 July 61, 20p. incl. illus. table (Trans. no. MCL-1065 of Radiotekhnika i Elektronika 5:1359-1369, 1960)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Radio waves, *Extraterrestrial radio waves, Atmospheric refraction, *Radio astronomy, *Ionospheric propagation, *Sun, Ionosphere, *Radio transmission, Ionospheric disturbances, Sunspots, Reflection, Radio interference, Refraction, *Radiofrequency oscillations, Wave transmission.

An experimental investigation is conducted of the ionospheric refraction, periodically changing with location angle, of 1.5 and 2 m radio waves during radio-astronomical observations of sunrise. A relation is established between this phenomenon and the radio emission of a group of sunspots. A determination is made of the spatial period of electron concentration waves in the ionosphere and their traveling speed along the earth's surface. A conclusion is drawn as to the identity of these waves with cellular waves in the ionosphere. Possible new properties are given for cellular waves; these properties are closely associated with their occurrence and existence with active processes on the sun. (Author)

AD-261 815 Div. 8
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE EFFECT OF INTERFERENCE OF AN FM AFC SYSTEM, PART I,
by V. I. Kaganov and N. S. Nemirovskiy.
26 July 61, 14p. incl. illus. 6 refs. (Trans. no. MCL-1098 of Radiotekhnika i Elektronika 9:1380-1386, 1960)
Unclassified report

DESCRIPTORS: Frequency modulation, *Electronic circuits, USSR, *Technological intelligence, *Radio interference, *Discriminators, Intermediate frequency filters, Signal generators, High pass filters, Limiters, Low pass filters, Mathematical analysis, Automatic, Frequency, Control, Radiofrequency, *Radiofrequency oscillations, Frequency stabilizers.

The operation is examined of an FM AFC system, when it is acted upon simultaneously by a useful signal and interference, for any signal-to-noise ratio. An analysis is given for an ideal discriminator with an average frequency different from zero, with and without taking an IF filter into account. (Author)

AD-261 840 Div. 8
(24 Aug 61) OTS price $5.60

American Optical Co., Southbridge, Mass.
OPTICAL DIELECTRIC WAVEGUIDES,
by Elias Snitzer. May 61, 51p. incl. illus.
(Scientific rept. no. 3)
(Contract AF 19(604)7207)
(AFCRL-359) Unclassified report

DESCRIPTORS: *Waveguides, Dielectrics, Glass textiles, Optical materials, Optical equipment, Refractive index, Mathematical analysis, Wave transmission, *Cavity resonators, Design, Interferometers, Propagation, Electromagnetic waves, Theory.

A general survey is given of the properties of small glass fibers acting as dielectric waveguides in the visible region of the spectrum. In addition to single mode propagation consideration is given to the coherent excitation of 2 or more modes, mode selection, quasi-bound modes in large fibers, and cross-talk between closely spaced fibers. Finally, the modes in a Fabry-Perot interferometer of wide plate spacing are discussed as the limiting case of a dielectric waveguide of large cross-section and vanishingly small index difference between core and cladding. (Author)

AD-261 847 Div. 8, 12
(23 Aug 61) OTS price $2.60

Norwegian Defence Research Establishment.
SCINTILLATIONS OF SIGNALS TRANSMITTED FROM EARTH

SATELLITES,
by J. Frihagen and J. Troim. Oct 60, 24p. incl. illus. (Technical note no. 1; Technical note no. T-53)
(Contract AF 61(052)344)
(AFCRL-332) Unclassified report

DESCRIPTORS: Norway, *Satellite vehicles, Extraterrestrial radio waves, Wave transmission, *Radio transmission, *Ionospheric propagation, Attenuation, Arctic regions, Magneto-optic rotation, Tests, Ionospheric disturbances, *Radio signals, Propagation, Tracking.

Results are presented from a study that was undertaken at the Norwegian Defence Research Establishment in connection with ionospheric effects on signals transmitted from earth satellites. Emphasis was given to the use of satellite signals in studies of the irregularities producing scintillations of the signal. Results of structure and height distribution of the irregularities are presented. (Author)

AD-261 856 Div. 8, 14, 26
(24 Aug 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
RESEARCH ON BINDER TECHNIQUES FOR HIGH TEMPERATURE RADOME STRUCTURES.
Interim engineering rept. no. 1, 17 Apr-17 July 61,
by H. T. Plant and P. P. Keenan, 17 July 61, 36p. incl. illus. tables.
(Contract AF 33(616)8176, Proj. 1-(670-4161))
Unclassified report

DESCRIPTORS: *Radomes, Materials, Ceramic materials, *Binders, Filament wound construction, *Ceramic fibers, Laminates, Aluminum compounds, Phosphates, Processing, Manufacturing methods, Preparation, High temperature research, Dielectric properties, Mechanical properties, Silicon compounds, Dioxides, Spheres, Glass, Electric insulation, Porosity, Porous materials.

Efforts were directed towards further characterizing and improving silica-fiber-reinforced aluminum phosphate laminates as a material for high temperature radome structures. Initial effort was primarily directed towards the improvement of equipment and techniques for the preparation and testing of silica-fiber-reinforced aluminum phosphate filament-wound laminates. A limited amount of binder formulations work was carried out using low density (sp gr of 0.3) hollow glass microspheres (30 - 300 microns) in place of high density fillers in an attempt to lower the dielectric constant and power factor. Aluminum phosphate binders were prepared containing glass microspheres but their presence produces early gellation of the binder even though the initial viscosity of the binder is lower than usual. Laminates based on these low density binders were prepared. Aging data (100 hr) resulting from laminates baased on 2 aluminum phosphate binder formulations (33Y3 and 3) clearly show a continued decline in flexural strength with 1000 F aging. (Author)

AD-261 861 Div. 8, 1, 6
(24 Aug 61) OTS price $18.50

Brunswick Corp., Marion, Va.
GRUMMAN AIRCRAFT ENGINEERING CORPORATION MODEL 128B10005-3 NOSE RADOME, SERIAL NO. 4, FOR THE A2F-1 AIRCRAFT.
Special acceptance test.
18 Apr 61, 364p. incl. illus. (Rept. no. GRU3-4, vol. 3)
(Subcontract to Grumman Aircraft Engineering Corp., Bethpage, N. Y., Contract NOa(s) 59-0259-c)
Unclassified report

DESCRIPTORS: *Attack bombers, Jet planes, *Naval aircraft, *Radomes, Tests, Antenna radiation patterns, *Radar antennas, Electronic equipment, Aircraft equipment, Microwave equipment, Electromagnetic properties, Wave transmission, Search radar, Radar tracking, Terrain, Radar navigation, Experimental data, *Jet bombers, Errors.

AD-261 876 Div. 8, 20
(24 Aug 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
GAIN-SHIFT VERSUS COUNTING RATE IN CERTAIN MULTIPLIER PHOTOTUBES,
by D. F. Covell and B. A. Euler. 8 June 61, 15p. incl. illus. table, 8 refs. (Rept. no. NRDL-TR-521)
Unclassified report

DESCRIPTORS: *Phototubes, *Photomultipliers, Electron tubes, Scintillation counters, Automatic volume control, *Gamma ray spectrometers, Reliability, Stability, Tests, Pulse height analyzers, Calibration, Measurement.

Multiplier phototubes used in scintillation counting show shifts in gain when subjected to high counting rates. The nature of these shifts varies significantly from tube to tube. The gain shift characteristic of certain phototubes was examined for use in gamma-ray scintillation spectrometry. Samples of Dumont, RCA, EMI, and CBS phototubes were evaluated. (Author)

AD-261 884 Div. 8
(24 Aug 61) OTS price $1.60

Radio Corp. of America, Lancaster, Pa.
DESIGN, DEVELOP, AND EVALUATE A HIGH-POWER INTEGRAL CIRCUITED TETRODE FOR 215 MEGACYCLE OPERATION.
Quarterly interim technical rept. no. 1, 14 May-30 June 61,
by I. E. Martin and F. F. Marinaro. 31 July 61, 16p. incl. illus.
(Contract NObsr-85371)
Unclassified report

DESCRIPTORS: *Tetrodes, Electron tubes, Very high frequency, Cavity resonators, Power amplifiers, Radiofrequency power, Impedance, Ceramic materials, *Electronic circuits, Design.

Research is concerned with the design, development and evaluation of a high-power integral circuited tetrode for 215 mc operation. The achievement of 825 kw peak power output over a 10% frequency band is the primary objective. Design considerations are presented for the output circuits, input circuits and radio frequency bypass systems. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-261 889 Div. 8
(24 Aug 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
A THREE-CAVITY HIGH-POWER L-BAND FILTER TUNABLE FROM 1250 TO 1350 Mc,
by E. M. T. Jones. Feb 61, 43p. incl. illus. tables (Technical note no. 2)
(Contract AF 30(602)1998)
(RADC TN 61-119) Unclassified report

DESCRIPTORS: L band, *Radiofrequency filters, *Cavity resonators, *Waveguide filters, Waveguide couplers, Waveguides, Narrowband, Transmission lines, *Low pass filters, Theory, Design, Effectiveness, Tuning devices, Wave transmission, Microwave equipment, Ultra high frequency, *Band-pass filters.

The design and low-power performance are presented for a high-power L-band filter, utilizing 3 direct-coupled TE 011 resonators. The filter is tunable from 1250 to 1350 mc and has a mid-band insertion loss varying from 0.14 to 0.32 db. The 3-db insertion loss bandwidth varies from 2.86-3.51 mc. The 60-db-insertion-loss bandwidth varies from 14.5 to 19 mc. The coupling apertures in the filter are rounded so that their theoretical power-handling capacity is greater than that of filter cavities. The theoretical midband power-handling capacity of the filter operating at atmospheric pressure is about 2 megawatts. At approximately the 1/2-db-insertion-loss points, at the edges of the pass band, the power-handling capacity has a minimum value of approximately 1 megawatt at atmospheric pressure. If this filter is operated at a gauge pressure of about 30 psi, its power-handling capacity is theoretically increased by a factor of 9 and hence its theoretical maximum power-handling capacity is increased to 9 megawatts. (Author)

AD-261 890 Div. 8
(24 Aug 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
A SAMPLING TECHNIQUE FOR THE MEASUREMENT OF HARMONIC POWER IN MULTIMODE WAVEGUIDE,
by E. D. Sharp and E. M. T. Jones. Feb 61, 47p. incl. illus. tables, 15 refs. (Technical note no. 3)
(Contract AF 30(602)1998)
(RADC TN 61-120) Unclassified report

DESCRIPTORS: Sampling, Test methods, *Waveguides, *Harmonic analyzers, Measurement, Radio interference analyzers, Microwave equipment, Waveguide filters, Waveguide couplers, Phase measurement, Low pass filters, Test equipment, Detectors, Theory, Propagation, Magnetrons, Waveguide irises, Magnetic fields, *Radio interference, *Radiofrequency power, Harmonic analysis.

A compact method is described of measuring the harmonic power, generated by a high-power transmitter, which can propagate in many different waveguide modes. In this method the H-field around the periphery of the waveguide is sampled by means of evenly spaced irises. Each iris is connected to a matched, calibrated detector. It is shown theoretically that by averaging the appropriate detector outputs the total multimode power propagating in the waveguide at a given frequency can be determined in most cases to within ± 3 to ± 5 db. In principle the total power propagating at each harmonic frequency can be measured instantaneously and continuously by summing, in appropriate circuitry, the output of the various detectors. The results of experimental measurements made at low and high powers are included. A measurement of the third harmonic power of the QK-338 magnetron was made. (Author)

AD-261 891 Div. 8
(24 Aug 61) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
A HIGH-POWER S-BAND WAFFLE-IRON FILTER,
by H. Guthart and E. M. T. Jones. Mar 61, 24p. incl. illus. tables (Technical note no. 4)
(Contract AF 30(602)1998)
(RADC TN 61-121) Unclassified report

DESCRIPTORS: *Radiofrequency filters, *Waveguide filters, Waveguides, Transmission lines, S band, *Band-pass filters, Attenuation, Design, Copper, Standing wave ratios, Microwave equipment, Measurement, Radiofrequency transformers.

A description is presented of the design and measured performance of a high-power S-band waffle-iron filter that has a wide, well-matched pass-band with low insertion loss and a wide high-attenuation stop-band free of spurious responses. The high-power waffle-iron filter, fabricated of OFHC copper, consists of 2 pairs of identical parts that can be relatively easily machined. The filter is matched to standard S-band waveguide with stepped transformers. The principal means used to enhance the power-handling capacity of the high-power filter beyond that of the low-power prototype filter are described. The maximum VSWR in the 2.7-4.1 kmc pass-band of the filter is 1.6, and the minimum insertion loss of the 5.3-12.4 kmc stop-band is 45 db. The high-power waffle-iron filter had a power-handling capacity of 2.09 megawatt of peak power without breakdown when the waveguide was pressurized to 30 psi (gage). Preliminary measurements on the filter indicated that it could transmit at least 4.5 megawatts of peak power. (Author)

AD-261 892 Div. 8
(24 Aug 61) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF HIGH-POWER FILTER TECHNIQUES. Final rept. 18 Feb 59-18 Feb 61,
by E. M. T. Jones, E. D. Sharp and others.
Mar 61, 30p. incl. illus. table, 16 refs.
(Contract AF 30(602)1998)
(RADC TR 61-152) Unclassified report

DESCRIPTORS: *Radiofrequency filters, *Waveguide filters, Waveguides, *Transmission lines, Waveguide couplers, Helixes, L band, Cavity resonators, Tuning devices, S band, *Band pass filters, Sampling, Harmonic analysis, Theory, Measurement, *Microwave equipment, Narrowband, Design, Test methods, Effectiveness, Electronic circuits.

An investigation was made of the electric gradients occurring at rounded edges in high-power transmission-line filters. Various types of dissipative filters which were investigated are described including a complete-transfer-coupler filter, and a 2-turn helical (rectangular waveguide) filter. A 3-cavity narrow-band L-band filter tunable from 1250-1350 mc is described. The measured performance is presented of an S-band waffle-iron filter that has a pass band extending from 2.6 to 4.1 kmc and a stop band with greater than 40 db attenuation extending from 5.3 to 12.5 kmc. A compact multi-aperture sampling technique is also described that can be conveniently used to measure the harmonic power propagating in multi-mode waveguide. (Author)

AD-261 899 Div. 8
(24 Aug 61) OTS price $2.60

Transistor Applications, Inc., Boston, Mass.
RESEARCH DIRECTED TOWARD ANALYSIS AND DESIGN OF TRANSISTOR CIRCUITS.
Scientific rept. no. 6, 1 Sep-30 Nov 60,
by A. W. Carlson. May 61, 22p. incl. illus. tables.
(Contract AF 19(604)4089)
(AFCRL-367) Unclassified report

DESCRIPTORS: *Transistors, *Switching circuits, Pulse modulation, Pulse amplifiers, Transistor amplifiers, Design, Electronic circuits, Distortion, Mathematical analysis, *Electronic switches, Radio signals, Trigger circuits, Low pass filters, Tests, Linear systems.

The use of switches, operated to produce a duration modulated pulse train, as a linear amplifier are discussed. An analysis of the signal and distortion is presented. It is shown, for a given degree of distortion, that modulating both leading and trailing edges of the pulses equally allows a lower pulse rate relative to the highest signal frequency than if only one edge is modulated. The efficiency of a single switch (SPST) in converting power supplied into ac signal power has a maximum of 50% (for lossless switch and sinusoidal signal). Circuits using 2 ideal lossless switches have efficiencies of 100% independent of signal amplitude (degree of modulation). Some experiments with transistor switches are described. (Author)

AD-261 900 Div. 8
(24 Aug 61) OTS price $8.60

Varian Associates, Palo Alto, Calif.
C-BAND TRAVELING-WAVE TUBE (VA-126) DEVELOPMENT PROGRAM.
Final rept.,
by J. A. Ruetz. Apr 61, 95p. incl. illus. table.
(Engineering rept. no. 214-1F)
(Contract AF 30(602)1774)
(RADC TR 61-146) Unclassified report

DESCRIPTORS: *Traveling wave tubes, C band, Electron tubes, X band, *Microwave amplifiers, Amplifiers, Design, Microwave equipment, *Radar equipment, Electronic circuits.

The development is presented of the VA-126 clover-leaf type pulsed traveling-wave tube amplifier for C-band. This tube has a minimum power output of 3 megawatts over a 9% bandwidth centered at 5650 mc, a minimum saturation gain of 28 db, a mean efficiency of 30%, and a duty cycle of 0.0023. The development program succeeded in meeting all design objectives and a slightly derated version is currently available as an off-the-shelf item. The VA-126, with its broad bandwidth and high power capability, has potential application in sophisticated radars using such ECCM techniques as pulse-to-pulse frequency changes, phase coding and pulse compression. (Author)

AD-261 917 Div. 8
(25 Aug 61) OTS price $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES.
Quarterly progress rept. no. 3, 15 Mar-15 June 61,
by R. L. Kyhl and H. W. P. Strandberg.
15 June 61, 15p. incl. illus. tables.
(Contract DA 36-039-sc-87376)
Unclassified report

DESCRIPTORS: *Paramagnetic resonance, *Masers, Paramagnetic crystals, *Microwave amplifiers, Amplifiers, Electron tubes, Ruby, Cavity resonators, Broadband, *Radio astronomy, *Microwave spectroscopy, Chromium, Crystals, Superhigh frequency, Magnetic fields, Tests, Design, Test equipment, Measurement.

The experiments on reactance compensation of the reflection type of cavity masers were brought to a successful conclusion. The measurements to determine optimum ruby concentration and the results obtained by using the double-cavity technique are described. Parallel experiments on unilateral broadband masers of the transmission type containing circularly polarized cavities have still not developed a converging adjustment procedure for the excessive number of interacting tuning parameters. There is still much engineering work to be done before the system can be used reliably as a part of a radio astronomy telescope or a supersensitive laboratory spectrograph. A bandwidth greater than 100 mc is obtained with a single ruby cavity. (Author)

AD-261 918 Div. 8
(25 Aug 61) OTS price $1.60

Melabs, Palo Alto, Calif.
MILLIMETER FERRITE DUPLEXING DEVICES.
Quarterly progress rept. no. 4, 15 Mar-14 June 61,
by R. A. Henschke. 14 June 61, 15p. incl. illus.
(Contract DA 36-039-sc-85351)
Unclassified report

DESCRIPTORS: Ferrites, Microwave equipment, *Ferromagnetic materials, *Electronic switches, *Waveguide switches, Transmission lines, *Radiofrequency attenuators, *Waveguides, Radar duplexers, Design, Tests, Attenuation, Standing wave ratios, Broadband.

A millimeter ferrite switch was constructed which provided VSWR's under 1.33 over the 8% frequency band with insertion losses under 1 db and isolation between uncoupled arms of greater than 20 db. Switching times of less than 1 microsecond were measured using a transistorized driver. Improvements were made in the construction techniques used for the high power isolator fixture and the effect of changes in magnet pole piece design was investigated. A ferrite pulsed attenuator was constructed having an input VSWR less than 1.3:1; an insertion loss less than 0.7 db; and maximum attenuation greater than 55 db over the frequency band. Switching times slightly greater than 1 microsecond were obtained with a high voltage supply. An experimental high power circulator was constructed having VSWR's less than 1.23:1, insertion loss less than 0.9 db, and isolation greater than 18 db over the 8% band. (Author)

AD-261 923 Div. 8, 15
(25 Aug 61) OTS price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A NEW THEORY OF CASCADE SYNTHESIS,
by D. C. Youla. 29 May 61, 40p. incl. illus.
(Research rept. no. PIBMRI-916-61)
(Contract AF 19(604)4143)
(AFCRL-514) Unclassified report

DESCRIPTORS: *Electrical networks, *Electronic circuits, Synthesis, Complex variables, *Electric filters, *Radiofrequency filters, Mathematical analysis, Digital computers, Programming.

A new result is presented generalizing Richard's theorem. It is then shown that this result leads to a complete, simple and unified theory of cascade synthesis which yields the types A, B, Brune, C and D sections in a direct and natural manner. The element values of the various sections are obtained in closed form in terms of three of six indices. Thus the extraction cycle is performed once and for all for the whole class of positive-real functions. Several problems are worked out in detail and a chart is constructed to facilitate the computations. The formulas are easily programmed on a digital computer. (Author)

AD-261 924 Div. 8
(25 Aug 61) OTS price $6.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
PARTIAL SYMMETRY OF A BOOLEAN FUNCTION AND SYNTHESIS OF DIODE SYMMETRIC CIRCUITS,
by William Chao-Wei Mow. 10 May 61, 70p. incl. illus. tables, 18 refs. (Rept. no. PIBMRI-904-61)
(Contract AF 19(604)6620)
(AFCRL-386) Unclassified report

DESCRIPTORS: Special functions, Synthesis, *Diodes, *Electronic circuits, Combinatorial analysis, Functions, Identification, *Switching circuits, Transmission, Matrix algebra, Electrical networks, Mathematical analysis.

A method is described of identification of partially symmetric Boolean functions and a systematic approach is presented for synthesizing diode symmetric circuits. The identification of partially symmetric functions is based upon the work of E. J. McCluskey which treats the detection of totally symmetric functions. A list of binary equivalents of the decimal numbers specifying the transmission function is tabulated in a truth-table called the transmission matrix; from this, the standard matrix is obtained. Functions which are symmetric only in a certain set of its input variables can be recognized from the derived standard matrix which is obtained by manipulation of standard matrix. A basic symmetric diode circuit is constructed by utilizing the principle of disjunctivity. For totally symmetric functions whose a-numbers form an arithmatic series, a set of rules are applied repetitively to reduce the number of diodes needed to recognize the given function. An identical diode network is also obtained by synthesizing the Boolean function from its decimal equivalents. An evaluation is made of the basic symmetric diode circuit and the process of reduction. (Author)

AD-261 936 Div. 8
(28 Aug 61) OTS price $5.60

Brown U., Providence, R. I.
DIELECTRIC COATED ANTENNA.
Rept. on Research Directed toward the study of Radiation of Electromagnetic Waves,
by Said Koozekanani. May 61, 56p. incl. illus. 10 refs. (Scientific rept. no. AF 4561/10)
(Contract AF 19(604)4561)
(AFCRL-515) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Wave transmission, Propagation, Dielectrics, *Antennas, *Dielectric films, Coatings, *Coaxial cables, Integral transforms, Simultaneous equations, Equations, Admittance, Electromagnetic wave reflections, Electromagnetic theory, Functions, Antenna radiation patterns, Potential theory.

Propagation of electromagnetic waves in a coaxial system is investigated. The configuration is that of an idealized dielectric coated antenna standing perpendicularly on a perfectly conducting plane being fed coaxially at its base. The method used involves integral transforms and leads to an infinite set of simultaneous linear equations relating an infinite number of unknowns. By proper choice of transverse dimensions only a finite number of equations and unknowns need be considered. It is therefore possible to obtain expressions for the amplitude of the surface wave and the admittance of the antenna. (Author)

AD-261 938 Div. 8, 30
(28 Aug 51) OTS price $5.60

Bell Telephone Labs., Inc., Whippany, N. J.
ENGINEERING SERVICES ON TRANSISTORS.
Interim technical rept. no. 4, 1 Jan-3 Mar 61, by M. M. Atalla, G. A. Dodson, and others.
3 May 61, 57p. incl. illus. tables.
(Contract DA 36-039-sc-85352, Projs. 3A99-21-001-01 and 3G19-06-001-01)
Unclassified report

DESCRIPTORS: *Transistors, Reliability, Aging, Failure (Mechanics), Tests, *Diodes, Germanium, *Transistor amplifiers, Electrical properties, Measurement, Switching circuits, Encapsulation, Storage, Design, Stresses, Test methods, Silicon, Temperature, Microwave equipment, Impurities.

Studies and investigations were continued on transistors and transistor-like devices with a view toward demonstrating and increasing the practicability of their use in operating equipment. Status reports are presented on: (1) accelerated step-stress aging of diodes, (2) a 3000-mc microwave germanium transistor, (3) a 1-watt, 1000 mc germanium transistor, (4) integrated circuit development, (5) transistor requirements for DCTL, and (6) an analysis of storage time behavior of diffused epitaxial silicon transistors. (Author)

AD-261 952 Div. 8, 30
(25 Aug 61) OTS price $8.60

Rosemount Aeronautical Labs., U. of Minn., Minneapolis.
DESIGN OF A MICROMINIATURE PRESSURE TRANSDUCER.
Interim rept. on Task 9R38-11-009-17,
by Lawrence D. Huppert, G. Leonard Kane, and Milbert R. Beiber. June 61, 87p. incl. illus. tables, 56 refs.
(Contract AF 33(616)6814)
(TREC Technical rept. no. 61-73)
Unclassified report

DESCRIPTORS: Pressure transmitters, Pressure, *Transducers, *Subminiature electronic equipment, Measurement, Diodes, Diaphragms (Mechanics), Sensitivity, Design, Acceleration tolerance, Resistance, *Piezoelectric transducers, Inductance, Electrostatic capacitance, Cavity resonators, Calibration, Instrumentation.

The problem of designing an accurate miniature pressure transducer suitable for bonding to a vehicle surface exposed to a moving airstream was reviewed in detail. A detailed discussion of newly evolved pressure-measuring techniques and adaptations considered feasible for this application is given. A design study of the diode principle for a miniature pressure transducer is presented. Details of the development of variable resistance pressure transducers along with calibration data are included. (Author)

AD-261 970 Div. 8, 25
(25 Aug 61) OTS price $3.60

Bell Telephone Labs., Inc., Whippany, N. J.
MICROWAVE SOLID-STATE DEVICES.
Interim rept. no. 4, 1 Jan-31 Mar 61.
31 May 61, 32p. incl. illus. tables, 12 refs.
(Contract DA 36-039-sc-85325, Proj. 3A-99-21-001-03)

Unclassified report

DESCRIPTORS: *Diodes, Microwave amplifiers, *Microwave equipment, Crystal limiters, *Semiconductors, Gallium compounds, Arsenides, Cadmium, Diffusion, Impedance, Resistance, Measurement, Manufacturing methods, Crystals, Thin films, Preparation, Solid state physics.

AD-261 973 Div. 8, 30
(28 Aug 61) OTS price $6.60

Battelle Memorial Inst., Columbus, Ohio.
SERVICES, INVESTIGATIONS, AND TESTS ON STANDARD AND NONSTANDARD PARTS AND MATERIALS. TASK 604. RESISTOR-SCREENING TESTS.
Final rept., 1 May 60-30 Apr 61,
by W. E. Chapin. 30 Apr 61, 67p. incl. illus. tables.
(Contract DA 36-039-sc-85294)

Unclassified report

DESCRIPTORS: *Carbon resistors, *Resistors, Current limiters, Metal films, Non-destructive testing, Tests, Electronic equipment, Test methods, Reliability, Effectiveness, Films, Resistance, Specifications.

AD-261 988 Div. 8, 2
(29 Aug 61) OTS price $9.10

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
BIBLIOGRAPHY OF EXTRATERRESTRIAL RADIO NOISE. SUPPLEMENT FOR 1953,
ed. by Martha Stahr Carpenter. 31 Jan 60, 107p.
(Research rept. no. EE 444)
(Contract Nonr-40122)

Unclassified report

DESCRIPTORS: *Bibliography, Radio waves, Extraterrestrial radio waves, *Noise (Radio), Radio transmission, Sun, Galaxies, Sources, *Radio astronomy, Solar corona, Radio equipment, Telescopes, Solar flares, Solar eclipse, Sunspots, Solar atmosphere, Plasma oscillations, Plasma physics, Radiofrequency, Stars, Moon, Comets, Radio interferometers, Radiometers.

Contents:
Radiation from the sun
General galactic radiation
Radiation from discrete sources other than the sun and moon
Radiation from the moon

AD-261 989 Div. 8
(28 Aug 61) OTS price $3.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
INVESTIGATION OF NOISE GENERATION IN ELECTRICALLY TUNABLE MICROWAVE OSCILLATORS.
Quarterly progress rept. no. 3, 15 Mar-15 June 61,
by G. C. Dalman and P. R. McIsaac. 15 June 61, 36p. incl. illus. 10 refs. (Research rept. no. EE 504)
(Contract DA 36-039-sc-87368)

Unclassified report

DESCRIPTORS: *Microwave oscillators, *Backward-wave oscillators, *Signal-to-noise ratio, Noise (Radio), Traveling wave tubes, Reduction, Noise analyzers, Design, Electron beams, Mathematical analysis, Electrical networks, Noise generators, Reflex klystrons, Microwave equipment, Helixes, Electron tubes, Test methods, X band, Backward-wave amplifiers.

Results are discussed which were obtained on the research project investigation of Noise Generation in Electrically Tunable Microwave Oscillators. Four aspects have been considered: signal-to-noise calculations, noise measurements, noise cancellation techniques, and circuit aspects of noise. In the signal-to-noise calculations a linear theory for backward wave oscillators is being developed which is intended as a guide in the design of low-noise tubes. The approach is to use a digital computer to discover the tube parameters that yield optimum noise performance. New computer results are reported. A linear theory for traveling-wave tubes, based on a normal mode expansion of the tape helix is outlined. Two noise-measurement programs are discussed. Progress is reported on the development of apparatus to measure noise near the carrier. The design of a beam noise analyzer is described. The noise cancellation research which is discussed involves consideration of higher-order beam-mode effects in helical beam couplers and possible experimental applications. (Author)

AD-261 996 Div. 8
(28 Aug 61) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
DESIGN CRITERIA FOR STABILIZATION OF TRANSISTOR GAIN WITH TEMPERATURE,
by George N. Kambouris. 15 May 61, 35p. 9 refs.
(DOFL rept. no. TR-935)
(Proj. 90295)

Unclassified report

DESCRIPTORS: *Transistors, *Transistor amplifiers, Amplifiers, Automatic volume control, Temperature, Feedback amplifiers, Stability, Impedance matching, Electronic circuits, Transformations (Mathematics), Equations, Feedback, Design, Tests.

An equation was developed for a generalized transistor amplifier network, expressing the relationship that must be maintained between circuit elements and the transistor small-signal parameters for minimum gain variations over wide temperature ranges. Employing a single-stage common-emitter amplifier with collector-to-base feedback and various degrees of mismatch relative to the design criteria, the relationship was checked from -50 to +90 C at 10, 100, and 500 kc. Results show that considerable improvement in gain stability can be obtained in going from the unmatched to matched condition, but with some reduction in the over-all gain, the loss being dependent on the relative magnitude of the generator and transistor input impedances. The normalized gain variations were reduced from a maximum of 18 db to less than 2 db over the temperature range. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-262 002 Div. 8
(28 Aug 61) OTS price $1.60

David Sarnoff Research Center, Princeton, N. J.
OSCILLISTOR DEVICE RESEARCH.
Quarterly rept. no. 1, 1 Mar-31 May 61,
by R. D. Larrabee. 30 June 61, 12p.
(Contract DA 36-039-sc-87415)
Unclassified report

DESCRIPTORS: *Oscillators, Semiconductors, Surface properties, Germanium, Processing, Electric fields, Magnetic fields, Perturbation theory, Tests, Surfaces, *Crystal oscillators, Measurement.

Research is concerned with studying the properties of the oscillistor for the purpose of uncovering the basic nature of the mechanism of oscillation and to disclose and evaluate any practical applications for the effect. An empirical surface treatment was found which enables one to prepare reasonably reproducible and stable oscillistors. By utilizing this surface treatment, it was possible to measure the criticality conditions. Tentative results are very rewarding since they are reproducible and can be represented by empirical analytic functions. It is anticipated that these criticality conditions will prove useful not only as a testing ground for the comparison of proposed oscillistor theories with experimental data, but also will be useful for estimating the feasibility of the oscillistor for practical applications. The present oscillistors have several limitations which restrict their use in some proposed applications. In particular, the necessity to operate oscillistors in a pulsed fashion at room temperature (to avoid excessive heating) and the difficulties encountered with regard to the surface limit the feasibility of the present oscillistors. Work is in progress to construct oscillistors with a suitable heat sink and with stable surfaces that will overcome these limitations. (Author)

AD-262 004 Div. 8
(29 Aug 61) OTS price $2.75

Radio Corp. of America, Harrison, N. J.
A STUDY OF HIGH TEMPERATURE MICROWAVE TUBE DESIGN AND PROCESSING. PHASE I.
Final technical rept. on phase 1, for 1 May 59-31 May 60 on Thermionic and Solid State Electronic Technology,
by J. Brous, J. C. Turnbull and others. June 60, 127p. incl. illus. tables.
(Contract AF 33(616)6563, Proj. 4156)
(WADD TR 60-324) Unclassified report

DESCRIPTORS: *Electron tubes, *Microwave equipment, Processing, Design, High temperature research, Alloys, Ceramic materials, Vapor pressure, Measurement, Electrical properties, Mechanical properties, Degasification, *Cathodes (Electron tubes), Gases, Tests, Secondary emission.

Vapor-pressure and/or evaporation-rate measurements were made of selected alloys and ceramics by measuring the rate of weight loss resulting from heating the materials at constant temperatures. The degassing properties of selected alloys in vacuum were studied at temperatures to 1000 C after initial baking at 400 C. The rate of permeation of selected alloys by nitrogen, hydrogen, carbon monoxide, and carbon dioxide were measured. The poisoning of the primary emission of an impregnated tungsten-matrix cathode by selected gases and metal vapors was studied. The severe poisoning by metals with the lowest vapor pressures is attributed to the retention of the metallic film on the surface of the heated tungsten-matrix cathode. Copper and gold, which do not alloy with tungsten and which have higher vapor pressure than those of the other metals studied, did not poison emission under the experimental conditions. (Author)

AD-262 006 Div. 8
(28 Aug 61) OTS price $1.10

Radio Corp. of America, Lancaster, Pa.
(No title).
Monthly letter-type progress rept. no. 1 1-31 July 61,
by I. E. Martin and F. F. Marinaro. July 61, 4p.
(Contract NObsr-85371)
Unclassified report

DESCRIPTORS: *Tetrodes, Electron tubes, Design, Very high frequency.

Research is presented on the design, development and evaluation of a high-power integral circuited tetrode for 215 megacycle operation. The primary objective was the achievement of 825 kilowatt peak power output over a 10 percent frequency band. Several design concepts for the output circuit have been completed, employing both double-peaked circuit coupling and single-peaked circuit coupling techniques. A computer program has been completed. (Author)

AD-262 014 Div. 8, 14, 26
(29 Aug 61) OTS price $12.50

Fenwal Electronics, Inc., Framingham, Mass.
HIGH TEMPERATURE THERMISTORS.
Rept. for June 59-Sep 60,
by Donald W. Brusch and Alexander E. Lawson. Sep 60, 172p. incl. illus. tables.
(Contract AF 33(616)6601, Proj. 4156)
(WADD TR 60-783) Unclassified report

DESCRIPTORS: *Thermistors, Production, High temperature research, Manufacturing methods, Stability, Test methods, Electrical properties, *Ceramic materials, Processing, Configuration, Controlled atmospheres, Chromium compounds, Oxides, Bismuth compounds, Spheres, Disks, Rods, Resistance, Measurement.

CONCLUSIONS: Chromic oxide is an adequate base material to be used in the manufacture of thermistors to be operated to 600 C. Despite the fact that the surface of these thermistors chemisorbs O, H and water vapor, thereby changing unit resistance, a suitable coating material will be found which will minimize this surface effect. Contaminating oxides can be added to the basic Cr2O3 to change the resistance ranges which can be achieved. It is possible, using this technique, to extend the useful operating range of these thermistors beyond 600 C. An adequate but extremely slow and tedious method of attaching leads to disks and rods has been developed. Test equipment was developed which will allow testing of these thermistors at 600 C. The temperature deviation of the test chamber has been held to within 0.01 C thereby allowing a very accurate measurement of thermistor resistance. (Author)

AD-262 017 Div. 8, 6
(8 Sep 61) OTS price $8.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN RF MULTIPLE BEAM FORMING TECHNIQUE,
by W. P. Delaney. 9 Aug 61, 85p. incl. illus. tables (Rept. no. 41G-0012)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Radar antennas, Antennas, *Radar receivers, Electronic scanners, *Antenna radiation patterns, Microwave equipment, Coupled antennas, L band, Phase shifters, Antenna couplers, Matrix algebra, *Dipole antennas, Lobing, Design, Tests, Electrical properties, Physical properties.

The emergence of the phased-array radar as a contender for the solution of certain radar problems has placed emphasis on simultaneous beam forming techniques. Recent tests and experiments on a 900 mc RF beam forming matrix demonstrated the effectiveness of this technique for use in phased array receiving systems. The matrix forms n overlapping fixed beams in space from an n element linear array antenna in an ideally lossless and completely passive manner using an intricate inter-connection of directional couplers and fixed phase shifters. The major advantages of this beam forming technique are: (1) it forms simultaneous multiple beams each of which have the full gain of the array aperture, and (2) it is a passive device which could be made very reliable and rugged. The principle of operation is explained by using some simple matrix configurations. These simple configurations are then extrapolated to 8, 16 and 64 element matrices and some of the characteristics of the matrix are summarized. A sixteen element beam forming matrix was tested extensively in the laboratory and on an antenna range. The physical and electrical characteristics of the matrix are described. (Author)

AD-262 030 Div. 8, 25
(30 Aug 61) OTS price $1.10

Birmingham U. (Gt. Brit.).
RESEARCH IN MICROWAVE SPECTROSCOPY.
Summary rept. no. 1, 1 Sep 59-31 Dec 60,
by John Sheridan. 31 Dec 60, 6p.
(Contract AF 61(052)641)
(AFOSR-1106)
Unclassified report

DESCRIPTORS: *Microwave spectroscopy, Manufacturing methods, Frequency multipliers, Miniature electronic equipment, Microwaves, Production, Detection, Klystrons, Measurement, Semiconductors, Crystals, Molecular spectroscopy, Acetylenes, Halogen compounds, Great Britain, Ion bombardment.

Methods of fabrication of miniaturized point-contact harmonic generators and detectors of millimeter-wave spectroscopy were developed which are efficiently reproducible and available for general spectroscopic use. Various methods of assembly, and a variety of semi-conducting materials, were assessed, and work was begun on ion-bombardment of semi-conductors for harmonic generation. A number of spectroscopic measurements were made partly during tests of harmonic generation, and partly with high-sensitivity spectrometers in the conventional microwave range. The analysis of some of the measurements in terms of molecular structures proved, in some cases, complex enough to require fairly extended computations, which are to be continued. In contrast, new measurements on certain isotopic species of simple molecules showed the need for revision of certain details of their structures. (Author)

AD-262 040 Div. 8
(25 Aug 61) OTS price $.75

National Aeronautics and Space Adminsitration, Washington, D. C.
IONOSPHERIC RESULTS WITH SOUNDING ROCKETS AND THE EXPLORER VIII SATELLITE (1960 XI),
by R. E. Bourdeau. Aug 61, 22p. incl. illus.
(Technical note no. D-1079)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1079.

DESCRIPTORS: *Ionosphere, *Electrons, *Ions, Density, Sounding rockets, Satellite vehicles, Recording devices, *Radio transmission, Radio communication systems, Photoemission, Magnetic fields, Ionization, Wave transmission.

A review is made of ionospheric data reported since the IGY from rocket and satellite-borne ionospheric experiments. These include rocket results on electron density (RF impedance probe), D-region conductivity (Gerdien condenser), and electron temperature (Langmuir probe). Also included are data in the 1000 kilometer region on ion concentration (ion current monitor) and electron temperature from the Explorer VIII Satellite (1960 XI). The review includes suggestions for second generation experiments and combinations thereof particularly suited for small sounding rockets. (Author)

AD-262 042 Div. 8, 2
(28 Aug 61) OTS price $2.60

Naval Research Lab., Washington, D. C.
ELEVATED DUCT PROPAGATION IN THE TRADE WINDS.
Final rept. on Phase 1,
by F. C. Macdonald. 1 June 61, 38p. incl. illus, tables (NRL rept. no. 5602)
Unclassified report

DESCRIPTORS: *Radio waves, *Propagation, Wave transmission, Atmospheric refraction, Refractive index, Very high frequency, Atlantic Ocean, Meteorological data, Anticyclones, *Climatic factors, Upper atmosphere, Stratosphere.

All of the maximum propagation ranges (at 220 mc) observed in an elevated duct region varied from 500 to 1200 miles, compared to less than 400 miles observed with the same equipment outside the duct. The measurements were made at the optimum season (November) in a trade-wind region between Brazil and Ascension Island (8 degree S latitude). The field strengths above 400 ft are as much as 40 db larger than those at lower altitudes. From the level at average duct height (6000 ft) the field decreases slowly to 10,000 ft, the maximum altitude investigated. The slow fading rate usually associated with duct propagation is not always observed, even on the very long range runs. An extrapolation to propagation conditions in the month of March via refractive index measurements indicates minimal ducting conditions 10 to 20% of the time. (Author)

AD-262 081 Div. 8, 20
(29 Aug 61) OTS price $3.60

Radiation Effects Information Center, Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SEMICONDUCTOR

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

DEVICES (FIRST ADDENDUM),
by F. J. Reid. 15 July 61, 36p. incl. illus. tables, 36 refs. (Addendum no. 1 to REIC rept. no. 10, AD-240 433)
(Contract AF 33(616)7375, Proj. 1448)
Unclassified report

DESCRIPTORS: *Semiconductors, *Radiation damage, Transistors, Diodes, Silicon, Germanium, Rectifiers, Selenium rectifiers, Radioactivity, Crystal rectifiers, Tests, Microwave equipment, Electrical properties.

Data are presented on investigations of standard silicon and germanium transistors, diodes, rectifiers, and such devices as unipolar transistors, Esaki diodes, and SiC, GaP, and selenium rectifiers. The data are intended to be sufficiently inclusive to make it valuable as a guide on effects which can be anticipated from nuclear radiation on electronic components utilizing semiconductor devices. (Author)

AD-262 087 Div. 8
(28 Aug 61) OTS price $9.60

Michigan U. Coll. of Engineering, Ann Arbor.
A STUDY OF THE BICONICAL ANTENNA,
by Martin Algirdas Plonus. May 61, 119p. incl. illus. tables, 12 refs. (Rept. no. 3620-1-F)
(Grant NSF-11286)
Unclassified report

DESCRIPTORS: *Biconical antennas, Antennas, Impedance, Equations, Special functions, *Electromagnetic theory, Matrix algebra, Electromagnetic fields, Simultaneous equations, Antenna radiation patterns, Mathematical analysis, Admittance, Impedance matching.

The problem of finding the input impedance to a biconical antenna presented considerable difficulty. The theory of the biconical antenna, particularly the process of mode matching, is examined and several interesting observations are made which lead to two methods, one for thin cones and one for thick cones, for obtaining the exterior mode coefficients. A further investigation reveals that for arbitrary cones a finite set of preferred modes exists which behave similarly to the modes of infinitesimally thin cones. From this a method is developed which approximates each interior mode coefficient by a finite number of exterior modes, called the subset. The terms in this finite subset are then shown to depend on the solution of a finite matrix which is of the same order as the number of terms in the subset. Finally, any exterior mode coefficient is determined from an expression which relates this coefficient to all interior modes. (Author)

AD-262 111 Div. 8
(28 Aug 61) OTS price $2.60

Kaiser Industries Corp., Palo Alto, Calif.
REQUIREMENTS FOR THE COINCIDENCE-PULSE SCANNING SYSTEM,
by Q. H. Joy. 15 June 61, 24p. incl. illus.
(Technical rept. no. 1)
(Subcontract to Douglas Aircraft Co., Inc., Contract Nonr-107600)
Unclassified report

DESCRIPTORS: *Electronic scanners, *Delay lines, Display systems, Analog systems, *Pulse generators, Mathematical analysis, Circuits, Automatic.

The circuitry requirements for raster scanning by the time coincidence of 4 pulses, where one pulse is introduced into each end of a horizontal delay line and a vertical delay line, are described. The time relationships among the pulses and the requirements of their accuracy were analyzed. From this analysis, criteria of linearity for the time-base voltage were derived that can be used to evaluate the feasibility of the various types of analog circuitry. This investigation also delineates the basic areas of the scanning system in which appropriate modifications need to be made. (Author)

AD-262 120 Div. 8, 30
(29 Aug 61) OTS price $3.60

Hughes Aircraft Co., Culver City, Calif.
HF, VHF, AND UHF POWER AMPLIFIERS AND OSCILLATORS.
Quarterly progress rept. no. 3, 1 Mar-31 May 61, by J. T. Thompson. Aug 61, 34p. incl. illus. tables.
(Contract DA 36-039-sc-85308)
Unclassified report

DESCRIPTORS: High frequency, Very high frequency, Ultra high frequency, *Power amplifiers, Amplifiers, *Oscillators, Microwave oscillators, Microwave amplifiers, *Transistors, *Transistor amplifiers, Electronic circuits, Computers, Measurement, Tests, Test equipment, Impedance, Test methods, Programming.

Investigations were made of variations in large signal parameters for common emitter, VHF transistor amplifiers. New large signal effective parameters are defined and related to the standard small signal parameters. Some of the relations, based upon early findings are shown. Also included is the derivation of an equivalent circuit for common emitter, VHF transistor operation that may be programmed into a computer for a numerical solution in terms of transistor and circuit parameters. Comparisons are made with actual laboratory circuit response. (Author)

AD-262 133 Div. 8
(28 Aug 61) OTS price $2.60

Tung-Sol Electric, Inc., Bloomfield, N. J.
RESEARCH AND DEVELOPMENT IN UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION.
Quarterly rept. no. 6, 4 Apr-3 July 61, by B. G. Firth, Warren C. Johnson, and Donald W. Mayer. 3 July 61, 24p. incl. illus. tables.
(Contract DA 36-039-sc-85120, Proj. 3A-99-13-001-01)
Unclassified report

DESCRIPTORS: *Cold cathode tubes, *Cathodes (Electron tubes), Electron tubes, *Oxide cathodes, Magnesium compounds, Coatings, Oxides, Thin films, *Secondary emission, Sprays, Field emission, Thermionic emission, Electrostatics, Design, Tests, Life expectancy.

Thin film cathodes with coatings 1 to 6 microns thick were made to sustain electron emission up to 9 ma/sq cm . Low work function interface cold cathodes electrostatically smoke coated with MgO were made to run with lower than normal voltages for 5,000 to 6,000 hours at 3.7 ma/sq cm. Similar cathodes spray coated had reduced voltages to a lesser degree. Spray coatings on zirconium sleeves had half the normal voltages of those on nickel, but were very short lived. A high degree of cleanliness of all major tube parts was

found to be essential. The noise characteristic is generally a better indication of cathode quality than plate voltage or glow appearance. Good cathodes can be made with various types of coating structure provided the porosity and thickness are optimized. No good cathodes made by spraying with MgO alone. (Author)

AD-262 137 Div. 8
(29 Aug 61) OTS price $6.60

Purdue U. School of Electrical Engineering, Lafayette, Ind.
DISTRIBUTION FUNCTIONS FOR OUTPUTS OF CERTAIN LINEAR FILTERS FOR RANDOM SQUARE-WAVE INPUTS,
by J. A. McFadden and A. R. Cohen. 1 Aug 61, 59p. incl. illus. 21 refs. (Technical rept. no. 1; PRF 2054)
(Contract Nonr-110015)
Unclassified report

DESCRIPTORS: *Low pass filters, Linear systems, Statistical functions, *Integrators, Integral equations, Mathematical analysis, Difference equations.

The problem is considered of the calculation of the distribution function of the output of a linear filter with a random square-wave input. The systems considered are the finite-time integrator, the RC low-pass filter, and certain restricted higher-order filters. The inputs are square-waves in which the lengths of axis-crossing intervals are random, but statistically independent. For the finite-time integrator with a coin-toss square-wave input, a difference equation for the characteristic function of the output is derived and solved. The continuity and differentiability properties of the distribution function of the output of an RC low-pass filter are discussed. Under specified conditions on an RC low-pass filter with a coin-toss square-wave input, the distribution function of the output is constructed. For the same problem, a functional equation is derived for the characteristic function of the output, and a recurrence relation is obtained for certain moments of the output. For a general square-wave input, an integral equation is derived for the characteristic function of the output of an RC low-pass filter at an axis-crossing of the input. From this equation a second recurrence relation for the moments of the output is obtained. For the coin-toss square-wave input, certain higher-order systems are also considered. (Author)

AD-262 146 Div. 8
(25 Aug 61) OTS price $7.60

Stanford Research Inst., Menlo Park, Calif.
ANTENNA DESIGN PARAMETERS.
Final rept. 1 Nov 56-31 May 61,
by R. C. Honey, E. D. Sharp and others. May 61, 79p. incl. illus. tables.
(Contract DA 36-039-sc-73106, Proj. 3-99-00-100)
Unclassified report

DESCRIPTORS: Antennas, *SLDT antennas, *Microwave equipment, Extremely high frequency, Antenna radiation patterns, Lobing, X band, K band, Waveguide bends, Broadband, Direction finding, Design, Tests.

A modified Purcell linear array was designed and built for the 35-gc band. A novel analytical technique was developed that promises to yield design data sufficiently precise for even very long arrays. Computer techniques were developed for designing linear arrays with widely and variably spaced elements. The problem of finding the optimum spacing for the elements in an array of isotropic elements was set up precisely, and solutions found for 2 cases. Beam-broadening modifications were studied for six leaky-wave antennas. A doubled-layered pillbox antenna was designed and built that has wide-band operation, no aperture blocking, and low-side-lobe patterns. Three types of wide-band omniazimuthal direction-finding antennas were built and tested. (Author)

AD-262 172 Div. 8, 30
(30 Aug 61) OTS price $3.60

David Sarnoff Research Center, Princeton, N. J.
INTEGRATED COMPUTER CIRCUITS USING UNIPOLAR TRANSISTORS.
Scientific rept. no. 4 on Research on Unipolar Control Devices,
by S. M. Marcus, M. E. Szekely and others.
15 Jan 61, 37p. incl. illus.
(Contract AF 19(604)5561)
(AFCRL-189)
Unclassified report

DESCRIPTORS: *Transistors, Electronic circuits, *Digital computers, Switching circuits, Computer logic, Synthesis, Resistance, Design, Silicon.

Research was continued on a new logic system employing direct-coupled unipolar transistors (DCUTL) for use in digital computers. Some of the fundamental integrated circuits are dealt with quantitatively. Optimization is considered of the passive element structure and the following computer circuits are synthesized in integrated form: (1) AND-circuit, (2) OR-circuit, (3) inverter, (4) half-adder, (5) memory, and (6) shift register. (Author)

AD-262 176 Div. 8, 26
(30 Aug 61) OTS price $6.60

RCA Industrial Tube Products, Lancaster, Pa.
PRODUCTION ENGINEERING MEASURE TUBE TYPE A2582A.
Quarterly rept. no. 4, 1 Apr-30 June 61,
by Ben Sheren. 30 June 61, 64p. incl. illus. tables.
(Contract DA 36-039-sc-85947)
Unclassified report

DESCRIPTORS: *Tetrodes, *Beam power tubes, Electron tubes, *Manufacturing methods, Production, Processing, Design, Tests, Test equipment, Test methods.

Distribution curves are shown to support the contention that the sprayed Lucite technique for spacing cathode and grid compares favorably with the hand process. With minor exceptions, pilot line facilities were made available in the manufacturing area for operations up to tube aging. The requirements and design of gauges for some of the critical parts are discussed. Various brazing techniques are discussed from a high production standpoint. Nickel thickness measurement devices based on eddy current and magnetic principles were tested and compared. Both were shown to be useable, but the eddy current device demonstrated greater sensitivity and independence of operator skill. The program of checking voltage and waveshapes was continued and a more thorough study of the semiconductors in the servo system was made. A broach was made

using the projection grinder and transparent fixturing. The slot width was off .0004 inch. A subsequent broach made by the same method, but redesigned slot-wise, was not useable because of the change. Preliminary cuts in high speed steel were made using the electrical discharge cutting process. (Author)

AD-262 183 Div. 8
(30 Aug 61) OTS price $2.60

Microwave Lab., Stanford U., Calif.
MICROWAVE RESEARCH.
Quarterly status rept. no. 9, 1 Feb-30 Apr 61. July 61, 24p. incl. illus. table (M. L. rept. no. 829)
(Contract Nonr-22548)
Unclassified report

DESCRIPTORS: *Microwave equipment, *Space charges, *Power amplifiers, Cyclotrons, *Klystron, Electron tubes, *Field emission, *Frequency multipliers, *Microwave networks, Coupling circuits, Ferroelectric materials, Ceramic materials, Ferrites, Propagation, Microwaves, *Wave transmission, Radiofrequency generators, *Plasma physics, Electron beams, Cesium.

Contents:
General studies of space-charge waves
Cyclotron resonance amplifier
Klystron efficiency studies
Field emission harmonic generation
Quantum harmonic generation
Parametric refrigeration
Ferroelectric devices
Ferrite nonlinear propagation
Ferrite doubler
Magnetoacoustic excitation in yttrium iron garnet
Generation of submillimeter waves
Plasma harmonic generation
Electron beam interaction with a cesium plasma

AD-262 191 Div. 8
(30 Aug 61) OTS price $2.60

Pacific Semiconductors, Inc., Lawndale, Calif.
DIODES, CLIPPER AND HOLD-OFF, HIGH VOLTAGE (10-20 KV).
Quarterly rept. no. 2, 1 Oct 60-1 Jan 61, by E. E. Maiden, W. F. Schnepple, and F. J. Snee. 1 Jan 61, 23p. incl. illus. tables (PSI rept. no. 4000: 7-2Q)
(Contract DA 36-039-sc-85070)
Unclassified report

DESCRIPTORS: *Diodes, Silicon, *Clipper circuits, Electronic circuits, *Subminiature electronic equipment, Packaging, Switching circuits, Electron tubes, Pulse modulation, Radar pulses, Design, Tests, Test equipment, Reliability, Semiconductors.

Several of the technological boundaries within which the clipper diode design must be accomplished were considered. Initial work was accomplished with alloy junction devices because of their excellent high voltage characteristics. However, difficulty in achieving good forward recovery characteristics indicates more emphasis should be directed toward development of high voltage diffused junction diodes. No significant problems were encountered in making dc test measurements and experimental models of the alloy junction type met technical requirements. Although this performance is sufficient for hold-off diode applications, it falls short of fast recovery clipper diode requirements. Characteristics were obtained for various types of alloy and diffused junction diodes. The diffused devices exhibited better forward recovery characteristics but, because of lower breakdown voltages, performance in high voltage clipper diodes is still in question. The need for a better definition of forward recovery test conditions and for satisfactory equipment for making this test has become of major importance to this work. (Author)

AD-262 198 Div. 8
(31 Aug 61) OTS price $6.60

Stanford Research Inst., Menlo Park, Calif.
ON THE COMPLETE LOGIC CAPABILITY AND REALIZABILITY OF TRIGGER-COUPLED NEURISTORS.
Interim rept. no. 4,
by H. D. Crane. July 61, 65p. incl. illus.
(Contracts Nonr-321200 and AF 33(616)7567)
Unclassified report

DESCRIPTORS: *Trigger circuits, Electric connectors, Synthesis, Propagation, *Electrical networks, *Coupling circuits, Electronic circuits, Mathematical logic, Signals, Electric relays, Analysis, Design, Neuromuscular transmission.

Neuristors may be interconnected in two basically different modes, defined as T junctions and R junctions; T for triggering and R for refractory. Study was performed to determine whether complete logic capability may be achieved with neuristor junctions that are based only on trigger-coupling. Study was motivated by the concern that R junctions may be somewhat more difficult to realize physically than T junctions. To achieve complete logic, it must be possible to synthesize with a triggering type of connection the basic inhibition property so directly offered by the R junction. Two techniques for achieving this type of connection are outlined. It is indicated that, based on these techniques, trigger-connected junctions can be realized which offer full logic capability. (Author)

AD-262 204 Div. 8
(30 Aug 61) OTS price $1.60

Watkins-Johnson Co., Palo Alto, Calif.
250-500 MC LOW-NOISE TRAVELING-WAVE TUBE AMPLIFIER.
Quarterly rept. no. 5, Apr-June 61, by Robert E. Vehn. 14 July 61, 16p. incl. illus.
(Contract AF 30(602)2200)
(RADC TN 61-152)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, *Microwave amplifiers, Amplifiers, Very high frequency, Ultra high frequency, P band, L band, Helixes, Electron beams, Noise (Radio), Reduction, Life expectancy, Tests, Design.

Ten tubes were built and 6 of these were tested. Three items to further improve noise figure performance were incorporated. Thes are: (1) a 20% larger diameter cathode and beam, (2) an enlarged opening in the bucket collector, and (3) coating the inside of the collector with carbon. Gains obtained when potentials were optimized for best noise performance were of the order of 30 db + or - 1 db over the octave frequency band. Noise performance improved from previous tubes. Noise figures less than 4.6 db over the octave band were obtained and the best single frequency noise

figure of 2.5 db at 328 Mc was obtained. Saturated power output in excess of 0.5 milliwatt was measured with an input signal strength of -27 dbm. Reverse attenuation was measured and found to exceed 75 db over the operating frequency band. Two tubes accrued running times in excess of 400 hours each with no sign of emission slumping or degradation of noise figure. (Author)

AD-262 220 Div. 8, 26
(31 Aug 61) OTS price $3.60

Clevite Corp., Cleveland, Ohio.
CERAMIC I-F TRANSFORMERS.
Quarterly rept. no. 4, 1 Mar-31 May 61, by D. R. Curran and D. J. Koneval. 11 July 61, 34p. incl. illus. tables (Rept. no. 19)
(Contract DA 36-039-sc-85346, Proj. 3G26-07-001-03)
Unclassified report

DESCRIPTORS: *Band-pass filters, Radiofrequency filters, Ceramic materials, *Intermediate frequency transformers, Piezoelectric materials, *Miniature electronic equipment, Reliability, Packaging, Electric fields, Electrodes, *Cavity resonators, Design, Manufacturing methods, Metal films.

An improved package for miniature radial resonators and filters in the 1.5 to 5 mc range utilizes a slot design in the micro-module configuration. Slot compartments for the resonators and all electrical interconnections are contained on or within the micro-module body wafer. The resonators can then be inserted and the assembly tested before the cover plates are attached. Three and five element filter sections, as well as single resonators, were satisfactorily packaged in this manner. The contribution of fringing electric fields to the range of action for dot electrodes on a ceramic wafer was determined graphically. The application of photo-etching techniques to obtain electrode configurations on ceramic wafers was investigated for electroless nickel, copper, and silver films. Of these, the most desirable appears to be electroless copper, which has adequate adhesion and yields sharp well defined photo-etched images. (Author)

AD-262 237 Div. 8, 25
(31 Aug 61) OTS price $2.60

Electronics Research Lab., U. of Calif., Berkeley.
ACTIVE NETWORK MATCHING OF ARBITRARY LOADS,
by R. A. Rohrer. 10 June 61, 23p. (Series no. 60, Issue no. 367)
(Grant G-12142)
Unclassified report

DESCRIPTORS: *Electrical networks, *Electronic circuits, *Impedance matching, Dummy loads, Admittance, Resistance, Impedance.

Passive matching of an arbitrary load to a purely resistive source is limited both as to obtainable gain-bandwidth product and as to the practicality of the passive network required. A matching technique is presented which uses one active element, a negative impedance converter, in a lossless coupling network. The ideal match achieved is not frequency limited, and the matching network consists of only a small number of elements. The only limitation on the method is that the load immittance must be either minimum susceptive or minimum reactive. (Author)

AD-262 239 Div. 8
(1 Sep 61) OTS price $4.60

Electronics Research Lab., U. of Calif., Berkeley.
THEORY AND DESIGN OF WIDE BAND PARAMETRIC CONVERTERS,
by E. S. Kuh. 1 June 61, 42p. incl. illus.
(Series no. 60, Issue no. 364)
(Navy Contract G-12142)
Unclassified report

DESCRIPTORS: Broadband, *Parametric amplifiers, Microwave amplifiers, Amplifiers, Theory, Electronic circuits, *Coupling circuits, Mathematical analysis, Impedance, Design, Electrostatic capacitance, *Frequency converters, Synthesis.

Existing works on parametric amplifiers deal mostly with the physical aspects of the device, the analysis and design of simple coupling circuits. The parametric converter is studied from the circuit theory point of view. The well-known small signal approach is used and the nonlinear capacitance is approximated by a periodically varying capacitance. A general circuit configuration is considered where the variable capacitance is imbedded in an arbitrary passive network. Formula for the power gain is derived in terms of the variable capacitance and appropriate impedances of the passive imbedding network. From the general formula, the maximum gain-bandwidth product is then studied by utilizing Bode's familiar relationships. Research is concerned with only the noninverting type parametric converter. Synthesis procedures for coupling networks to approach the optimum gain bandwidth are presented. A design example indicates that even with the above assumption, a converter with 70% bandwidth can be obtained to achieve a power gain within 1/2 db from the optimum. (Author)

AD-262 250 Div. 8
(1 Sep 61) OTS price $7.60

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
STUDIES OF ELECTRON TUBE MATERIALS AND THERMIONIC EMISSION PROCESSES.
Scientific rept. no. 5, 1 Apr-30 June 61. 30 June 61, 74p. incl. illus. tables (Rept. no. TR61-704-104-204-205-208.10)
(Contract AF 19(604)7286)
(AFCRL-567)
Unclassified report

DESCRIPTORS: Electron tubes, Materials, *Thermionic emission, Cathodes (Electron tubes), Nickel, Tungsten, Aluminum compounds, Electron microscopy, Barium, Diodes, *Oxide cathodes, Mass spectrometers, Impurities, Theory, Crystals, Vacuum systems, Spectrographic analysis, Gases, Measurement, X-ray diffraction analysis.

A continuously heated tantalum wire produces a vacuum ambient approximately one order of magnitude lower than barium flash getters in the special diodes used for the study of pure nickel-based oxide cathodes. Efforts to activate cathodes having pure nickel bases by means of electrolytic methods were aided by shot noise monitoring techniques. The application of a new analytical technique to the analysis of nickel samples was started. Operation of the completed mass spectrometer-Knudsen cell instrumentation was also started. Work was continued to determine the causes of lack of performance and to

establish the sensitivity of silver. Investigations were conducted toward confirmation and generalization of the theory to cover the phenomena on ultra-pure nickel. Identification of crystal sites showing emission reversal by using X-ray diffraction techniques is discussed.

AD-262 275 Div. 8
(5 Sep 61) OTS price $5.60

Institute of Research, Lehigh U., Bethlehem, Pa.
TRANSISTOR CHARACTERIZATION AND ACTIVE NETWORK STUDIES.
Technical rept. no. 1, 1 Sep 60-31 May 61, by T. B. Ramachandran, A. I. Larky and J. J. Karakash. 30 June 61, 52p. incl. illus. tables, 21 refs.
(Signal Corps Grant 2-SC-61)
Unclassified report

DESCRIPTORS: *Transistors, Electrical properties, Electric fields, Semiconductors, Theory, Transistor amplifiers, Lattices, Impurities, Electric currents, Partial differential equations, Integral equations, Differential equations, Electrical networks.

At moderate to high values of emitter current in a transistor, the effect of the majority carrier current upon the minority carrier distribution is not negligible. An expression for the electric field in the base, consistent with the majority as well as the minority carrier distribution is derived, and an approximate solution of the resulting equation, valid at moderate to high values of emitter currents, is given. The effect of the emitter current on the characteristics of the charged carriers is taken into account in carrying out the computations for a typical pnp transistor. The calculations indicate that: (1) the dc transport factor decreases monotonically with increasing emitter current, (2) the emitter efficiency saturates to a limit at high emitter currents, and (3) the common base cut off frequency increases to a maximum at relatively moderate emitter currents, and then monotonically falls off to zero at exceedingly high emitter currents. These results are in agreement with known experimental data. (Author)

AD-262 280 Div. 8, 7
(31 Aug 61) OTS price $2.60

International Resistance Co., Hollywood, Calif.
MINI-BLOK MINIATURE RECTANGULAR METAL FILM RADIAL LEAD PRECISION RESISTOR.
Interim development rept. no. 1, 27 Mar-27 June 61,
by Benjamin Solow, 30 June 61, 21p. incl. illus. tables.
(Contract NObsr-85292)
Unclassified report

DESCRIPTORS: *Resistors, Metal films, *Miniature electrical equipment, *Miniature electronic equipment, Design, Lead, *Printed circuits, Packaging.

Research concerns the further development of a high precision miniature radial lead metal film resistor. The particular configuration permits very dense packaging on printed circuit board assemblies. The resistor will be rated at 1/10 watt at 85 C ambient. The maximum volume will be 5 x 1/10,000 cubic inches. The resistance range will be from 100 to 200,000 ohms. The resistor will have a rectangular body with radial leads and will be adjustable by means other than spiralling. Alumina was selected as the most suitable substrate material. Samples were prepared in a somewhat larger size. Preliminary test data obtained on some of these parts indicate reasonable feasibility of the contract requirements. (Author)

9. FLUID MECHANICS

AD-261 501 Div. 9
(21 Aug 61) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
PRESSURE DISTRIBUTIONS ON A HEMISPHERE CYLINDER AT SUPERSONIC AND HYPERSONIC MACH NUMBERS,
by A. L Baer. Aug 61, 34p. incl. illus. tables, 13 refs. (Rept. no. AEDC TN 61-96)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, Bodies of revolution, Aerodynamic configurations, *Supersonics, *Hypersonics, *Aerodynamics, Pressure, Drag, Shock waves, Reynolds number, *Blunt bodies, Hemispherical shells.

Pressure distribution tests at supersonic and hypersonic speeds were conducted in the von Karman Gas Dynamics Facility (VKF), Arnold Center, Air Force Systems Command on AGARD Model E, a hemisphere cylinder configuration. Various experimental data concerning the aerodynamic characteristics of blunt nosed bodies are available; however, relatively few sources present findings over a wide Mach number range. The present investigations, stimulated by the need for applicable experimental data to compare with the predictions of various theories, were conducted at Mach numbers 2 through 8 over a Reynolds number range from 0.17 x 10 to the 6th power to 0.51 x 10 to the 6th power per inch. A comparison is made of experimental results with available theoretical predictions of pressure distributions, pressure drag, shock wave shapes, and bow shock wave detachment distances. (Author)

AD-261 539 Div. 9
(21 Aug 61) OTS price $5.60

Naval Ordnance Test Station, China Lake, Calif.
AN APPLICATION OF POTENTIAL FLOW TO SLENDER BODIES OF REVOLUTION,
by Jack F. Reynolds. 15 Feb 61, 48p. incl. illus. table (NOTS TP 2626)
(NAVWEPS rept. no. 7623) Unclassified report

DESCRIPTORS: *Fluid flow, Partial differential equations, *Bodies of revolution, Volume, Acceleration, Convection, Motion, Vector analysis, Particles, *Cylindrical bodies, Velocity, Acoustics, Compressible flow, Perturbation theory, Pressure, Pitch, *Hydrodynamics, Theory, Integral equations.

The Eulerian equations of motion for frictionless flow are developed in vector form for both a fixed and a moving frame of reference. Upon integrating the Eulerian equation describing the motion of a fluid particle relative to

a moving coordinate system, the pressure on a slender body of revolution takes the form $\rho[U_{x'}(\partial/\partial x') + (\partial/\partial t)]\phi$. Included is a development of the perturbation velocity potential for cross flow which has the form $U_c \cos \Theta' S(x')/\pi r$. In the absence of a velocity gradient in the fluid far from the body, the normal force is obtained upon integrating the expression $\rho[U_{x'}(\partial/\partial x') + (\partial/\partial t)][U_c \cos \Theta' S(x')/\pi r]$ over the body surface. (Author)

AD-261 544 Div. 9
(21 Aug 61) OTS price $6.60

James Forrestal Research Center, Princeton U., N. J.
HYPERSONIC STUDIES OF BLUNT TWO-DIMENSIONAL SWEPT WINGS AT ZERO ANGLE OF ATTACK,
by S. M. Bogdonoff and I. E. Vas. Apr 59, 68p. incl. illus. tables, 14 refs. (Rept. no. 451)
(Contract AF 33(616)5416)
(ARL TN 60-125) Unclassified report

DESCRIPTORS: *Hypersonics, Aerodynamics, *Swept- back wings, Wings, Blunt bodies, Pressure, Aerodynamic configurations, Model tests, Hypersonic wind tunnels.

A series of tests in the Princeton University Helium Hypersonic Wind Tunnel were carried out on blunt swept wings at zero angle of attack with sweep angles up to 70 degrees at Mach numbers from 7 to 18. The measured pressure distributions were compared to the simple approximate calculations of inviscid effects (based on blast wave analogy using the normal Mach number) added to the viscous effects (calculated as if no sweep were present). Although such an approach gave a reasonable correlation for the unswept wing, the same approach for a swept wing does not give consistently satisfactory results. Deviations above and below the calculated value by as much as 40-50% were measured and there seems to be no systematic variation with either Mach number or Reynolds number. At constant high Reynolds number, it was found that the pressure distributions varied with the distance along the wing with an exponent between about -0.53 and -0.58. The pressure at a given station, for a fixed Mach number and a given leading edge thickness, varied as the cosine of the sweep angle to the 1.1 power as compared to the 1.3 power predicted from general geometrical sweep considerations. Rather strong deviations from the general trends for both the pressure distribution level and slope occurred for the 70 degree sweep case. (Author)

AD-261 547 Div. 9
(18 Aug 61) OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
ON LINEARIZED SWIRLING WAKES,
by Martin H. Steiger and Martin H. Bloom. July 61, 17p. incl. illus. (PIBAL rept. no. 706)
(Contract AF 49(638)445; Proj. 9781)
(AFOSR-1054) Unclassified report

DESCRIPTORS: *Axially symmetric flow, Wake, Mathematical analysis, Functions, Fourier analysis, *Gas flow, Fluid mechanics, Partial differential equations, Integral equations, Vortices.

Mathematically exact solutions for axisymmetric wakes with small swirl in a constant-property medium are derived by two methods. The first depicts the eigenvalue problem associated with the method of separation of variables and includes the so-called similar solution. The second technique utilizes Fourier methods and Hankel transforms, and solutions are given for both the axial and circumferential velocities in terms of arbitrary initial conditions. The solution produces an infinite continuous set of eigenvalues and eigenfunctions that satisfy the appropriate boundary conditions at the axis and infinity. This is consistent with the fact that a solution is unique only if an initial distribution or eigenvalue is prescribed a priori. The question of what type of flow can be produced physically at an initial station arises and also is discussed, and their importance to experimental observations noted. (Author)

AD-261 699 Div. 9
(22 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENTS OF AERODYNAMIC HEAT TRANSFER AND BOUNDARY-LAYER TRANSITION ON A 15 DEGREE CONE IN FREE FLIGHT AT SUPERSONIC MACH NUMBERS UP TO 5.2,
by Charles B. Rumsey and Dorothy B. Lee. Aug 61, 43p. incl. illus. table, 16 refs. (Technical note no. D-888; Supersedes NACA Research memo. L56F26, AD-109 102)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-888.

DESCRIPTORS: *Conical bodies, Bodies of revolution, Aerodynamic configurations, Heat transfer, *Aerodynamic heating, *Aerodynamics, *Supersonics, *Hypersonics, Boundary layer, Laminar boundary layer, Turbulent boundary layer, Reynolds number, Measurement, Model tests.

Measurements of aerodynamic heat transfer have been made at several stations on the 15 degree total-angle conical nose of a rocket-propelled model in free flight at Mach numbers up to 5.2. Data are presented for a range of local Mach number just outside the boundary layer from 1.40 to 4.65 and a range of local Reynolds number from 3.8 times 10 to the 6th power to 46.5 times 10 to the 6th power, based on length from the nose tip to a measurement station. Laminar, transitional, and turbulent heat-transfer coefficients were measured. The laminar data were in agreement with laminar theory for cones, and the turbulent data agreed well with turbulent theory for cones using Reynolds number based on length from the nose tip. (Author)

AD-261 700 Div. 9, 12
(22 Aug 61) OTS price $2.00

National Aeronautics and Space Administration, Washington, D. C.
WIND-TUNNEL INVESTIGATION OF A BALLOON AS A TOWED DECELERATOR AT MACH NUMBERS FROM 1.47 TO 2.50,
by John T. McShera and J. Wayne Keyes. Aug 61, 75p. incl. illus. tables (Technical note no. D-919)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-919.

DESCRIPTORS: *Aerodynamics, *Supersonics, *Balloons, Aerodynamic configurations, Drag,

Safety devices, *Guided missiles, *Satellite vehicles, Rockets, Recovery, Stabilization, Stability, Pressure, Heat transfer, Aerodynamic heating, Wind Tunnels, Tests, Towed bodies, Model tests, Pressure, Temperature, Recovery vehicles.

A wind-tuhnel investigation has been conducted to study the characteristics of a towed spherical balloon as a drag device at Mach numbers from 1.47 to 2.50, Reynolds numbers from 0.36 times 10 to the 6th power to 1.0 times 10 to the 6th power, and angles of attack from -15 to 15 degrees. Towed spherical balloons were found to be stable at supersonic speeds. The drag coefficient of the balloon is reduced by the presence of a tow cable and a further reduction occurs with the addition of a payload. The balloon inflation pressure required to maintain an almost spherical shape is about equal to the free-stream dynamic pressure. Measured pressure and temperature distribution around the balloon alone were in fair agreement with predicted values. There was a pronounced decrease in the pressure coefficients on the balloon when attached to a tow cable behind a payload. (Author)

AD-261 740 Div. 9
(22 Aug 61) OTS price $2.60

Southwest Research Inst., San Antonio, Tex.
APPLICATION OF THE GENERALIZED PHASE-PLANE-DELTA METHOD TO MULTI-DEGREE-OF-FREEDOM VIBRATING SYSTEMS,
by Wen-Hwa Chu and H. Norman Abramson. 1 June 61, 19p. 11 refs. (Technical rept. no. 4)
(Contract Nonr-272900, Proj. 23-834-2)
Unclassified report

DESCRIPTORS: Vibration, *Ships, Differential equations, Mathematical analysis, Linear systems, Nonlinear systems, Digital computers, Errors, Harmonic oscillators, Motion, *Hydrodynamics, Oscillation.

The phase-plane-delta method of Jacobsen is extended to multi-degree-of-freedom systems governed by differential equations of second order. Applications to initial value problems of two-degree-of-freedom systems are presented as demonstrations of the practical utility of the method. Agreement with exact solutions for linear systems (free and forced oscillations) and with approximate solutions for nonlinear systems (free and forced oscillations) is excellent. A practical truncation error analysis is included as an appendix, which shows that the method is a second order process. (Author)

AD-261 767 Div. 9
(23 Aug 61) OTS price $2.60

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
ON THE DIVERGENCE FORM OF SOME GAS DYNAMIC EQUATIONS FOR GENERAL CURVILINEAR CO-ORDINATES,
by John W. Brook. July 61, 30p. incl. illus.
(Research memo. no. RM-189)
(Contract AF 33(616)6400)
Unclassified report

DESCRIPTORS: *Gas flow, *Dynamics, *Partial differential equations, Equations, Fluid mechanics, Tensor analysis.

A rearrangement is presented of the basis gas dynamic equations for general curvilinear co-ordinates into divergence form. The system is specialized to a generalized two-dimensional system and, in greater detail, to a general conical system. One of the variables can then be eliminated by integration and the results are ordinary differential equations which represent a simplified description of the phenomenon under study. A partial listing of the divergence form of the equations for various orthogonal co-ordinate systems is also included.

AD-261 807 Div. 9
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW DEVELOPMENTS IN AERODYNAMICS,
by L. I. Sedov. 18 July 61, 5p. (Trans. no. MCL-1043 of Pravda 36, p. 3, 5 Feb 61)
Unclassified report

DESCRIPTORS: *Aerodynamics, *Supersonics, Shock waves, Theory, *USSR, Technological intelligence.

AD-261 813 Div. 9
(22 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE DYNAMICS OF EXTERNAL REGULATION SYSTEMS WITH MEMORY UNDER LOW FREQUENCY EXTERNAL DISTURBANCES,
by A. P. Yurkevich. 26 July 61, 21p. incl. illus. 6 refs. (Trans. no. MCL-1075 of Izvestiya Akademii Nauk SSSR. Otdeleniye Tekhnicheskikh Nauk, Energetika i Avtomatika 6:123-132, 1960)
Unclassified report

DESCRIPTORS: *Control systems, Memory devices, Oscillation, Control, *Commutators, USSR, *Dynamics, Harmonic analysis, Motion, *Technological intelligence.

The article examines extremal control processes with memory for a low-inertia object considering the action of low-frequency disturbances, and estimates the possibility of increasing the accuracy of controlling the dynamic conversion of the input signal. The accuracy of extremal control is evaluated most simply by using the method of harmonic balancing. With a low-inertia object this method, considering the basic harmonic, gives a rough approximation in the given case, the solution is complicated if higher harmonics are considered. The parameters of steady motion can be determined by applying an accurate method, but this method does not make it possible to explain the nature of the process of extreme searching. To solve these problems, the present work uses methods of constructing the phase trajectories of a system on multilayer surfaces and point-by-point conversions, developed previously. These methods give a full solution to the problem. (Author)

AD-261 827 Div. 9
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE MECHANISM OF CAVITATION IN CENTRIFUGAL

PUMPS (O Mekhanizme Kavitatsii V Tsentrobezhnykh Nasosakh),
by N. S. Yershov. 27 June 61, 10p. incl. illus. (Trans. no. MCL-1156 of Izvestiya Vysshikh Uchebnykh Zavedenii, Ministerstvo Vysshego Obrazovaniya SSSR, Seriya Aviatsionnaya Tekhnika 2:57-63, 1959)

Unclassified report

DESCRIPTORS: *Centrifugal pumps, *Cavitation, Aerodynamics, Hydrodynamics, Tests, USSR, Technological intelligence, Pumps.

Efforts indicate that latent cavitation in wheels with an increase in the width of vane input originates and develops in the ring eddy formed by reverse flows at the input into the wheel. Experiments with cones showed that an artificial change in form of ring eddy can improve the anticavitational qualities of the wheel. Also, control of the cavitational processes, taking place in the zone of reverse flows, appears to be one of the possible methods of improving the disruption characteristics of centrifugal wheels. (Author)

AD-261 846 Div. 9, 12
(23 Aug 61) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
PRESSURE DISTRIBUTION AND SHOCK SHAPE OVER BLUNTED SLENDER CONES AT MACH NUMBERS FROM 16 TO 19,
by Clark H. Lewis. Aug 61, 21p. incl. illus. tables (AEDC TN 61-81)
(Contract AF 40(600)800)

Unclassified report

DESCRIPTORS: *Conical bodies, *Bodies of revolution, *Blunt bodies, Aerodynamic configurations, Aerodynamics, *Hypersonics, Pressure, *Shock waves, Hypersonic wind tunnels, Model tests.

Pressure distributions and shock shapes were measured over spherically blunted and flat-nosed 9-deg half-angle cones at Mach numbers from 16 to 19 and unit Reynolds numbers (Re/in.) in the range from 0.19 to 0.65 times 10 to the 5th power. The pressure distributions for the flat-nosed cone show an overexpansion followed by a pressure peak above the conical value and then an approach to the constant cone value. This experimental observation is generally in agreement with recent theoretical studies which consider the inviscid induced pressure field produced by nose bluntness at hypersonic speeds (blast wave effect). The results of the pressure distribution over the spherically blunted cone agree well with a characteristic solution but do not agree with theoretical estimates from nose-bluntness-induced theories. The shock shape for the flat-nosed cone is displaced farther from the body than the nose-bluntness-induced theory predicts; however, the slope of the shock wave is well predicted by the theory. The shock shape over the spherically blunted model agrees well with the theory, and the slope agrees with both theory and a characteristic solution. (Author)

AD-261 935 Div. 9, 30
(28 Aug 61) OTS price $3.60

Broadview Research Corp., Burlingame, Calif.
DEVELOPMENT OF A MINIATURE DYNAMIC PRESSURE GAUGE.
Final rept.,
by K. Kaplan, C. W. Wilton, and A. B. Willoughby. Jan 61, 31p. incl. illus. (Rept. no. BRC 146-18)
(Contract AF 29(601)1200, Proj. 1080)
(AFSWC TR 61-7) Unclassified report

DESCRIPTORS: *Pressure gages, Design, *Shock tubes, Shock waves, Tests, Sensitivity, Calibration, Operation, Noise, Air, Motion, Gas flow, *Laboratory equipment, Disks, Piezoelectric gages, Pressure.

The report describes the development of a miniature dynamic pressure gage suitable for shock-tube use, and for use in shock flows of relatively short duration. Several disk-shaped gages, which employed a single sensor of the difference between stagnation and side-on pressure, were fabricated and tested in a shock tube. Each completed gage contained minor modifications of a basic design, and each exhibited a different rise time, noise level, and sensitivity. One of these gages, the Q-5, was delivered to the Air Force Shock Tube Lab in December 1960 and satisfactorily passed evaluation and calibration tests in the 4-in. shock tube, in the 5 to 25 psi region for shock wave durations of 6 to 7 ms. The report describes the operating principles and the design of these gages, and summarizes the development program. It also presents preliminary data on a gage of similar design which incorporates diaphragms in the disk faces, and data on the operating characteristics of the Q-5 gage. (Author)

AD-261 942 Div. 9, 30
(28 Aug 61) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
AERODYNAMIC PERFORMANCE OF A THIRD STAGE PLENUM EVACUATION COMPRESSOR OF THE ARNOLD CENTER PROPULSION WIND TUNNEL,
by B. B. Estabrooks, R. A. Robinson, and M. H. Jones. July 61, 37p. incl. illus. (Rept. no. AEDC TN 61-90)
(Contract AF 40(600)800)

Unclassified report

DESCRIPTORS: *Wind tunnels, *Transonic wind tunnels, *Supersonic wind tunnels, *Jet engines, *Rocket motors, Test facilities, Compressors, *Axial flow compressors, Stalling, *Aerodynamics, Pressure, Tests.

The aerodynamic performance of a third stage compressor of the Plenum Evacuation System of the Propulsion Wind Tunnel Facility was determined at inlet guide vane angle settings for minimum, design, and maximum capacities. In addition to the normal steady-state pressure and flow measurements, transient measurements of the pressures in the ducts adjacent to the compressor were obtained during definition of the compressor stall boundary. The compressor realized a maximum stall boundary pressure ratio of 2.15 to 2.26 with variation of inlet guide vane angle from +15 to -15 deg at an inlet temperature of 100 F. At the compressor design pressure ratio of 2.00 the measured inlet volume flow was 1285 and 1485 cfs at minimum (+15 deg) and maximum (-15 deg) inlet guide vane angle settings, respectively. The measured compressor adiabatic efficiency at the design condition was 87 percent. Measurements were also obtained that defined a double-valued compressor characteristic, composed of the normal characteristic and a stalled branch of the characteristic. (Author)

Division 9 - FLUID MECHANICS

AD-262 022 Div. 9
(25 Aug 61) OTS price $3.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
BLUNT BODY THEORY FOR HYPERSONIC FLOW,
by K. Hida. Jan 61, 19p. illus.
(Contract AF 49(638)476)
(AFOSR-204) Unclassified report

DESCRIPTORS: *Blunt bodies, *Hypersonic flow, Gas flow, Specific heat, Shock waves, Axially symmetric flow, Hypersonics.

A systematic analysis of Newtonian flow past an axi-symmetrical blunt body is developed by expanding various physical quantities in power series of lambda equals (gamma-1)/(gamma+1), where gamma stands for the ratio of specific heats of a gas. Some general results such as stand-off distance, pressure distribution along the axis of symmetry are given, provided that the shock is detached and has finite curvature at its nose. More extensive calculations are made for the flow past a flat-faced disc and power-law bodies. (Author)

AD-262 024 Div. 9, 25
(25 Aug 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
HYDRODYNAMIC AND THERMODYNAMIC CONDITIONS BEHIND REFLECTED SHOCK WAVES IN OXYGEN AND NITROGEN,
by Murray Scheibe. June 61, 24p. incl. illus.
(Rept. no. 6-90-61-18)
(Contract AF 29(601)2774)
Unclassified report

DESCRIPTORS: *Shock waves, *Oxygen, *Nitrogen, Hydrodynamics, Thermodynamics, High temperature research, Gases, Superaerodynamics.

The equilibrium conditions behind reflected shock waves in oxygen and nitrogen over a range of initial pressures of 0.5 mm Hg to 760 mm Hg and up to temperatures of about 24,000 K have been computed. An IBM 704 code developed at Los Alamos Scientific Laboratory by Russell E. Duff was used. The species included were N2, N, N2(+), N(+), N(++), N(-), O2, O3, O, O2(+), O(+), O(++), O2(-), O(-), and e. (Author)

AD-262 031 Div. 9
(30 Aug 61) OTS price $3.60

Centre National d'Etudes et de Recherches Aeronautiques, Brussels (Belgium).
LEADING EDGE EFFECT ON SEPARATED SUPERSONIC FLOWS,
by Jean J. Ginoux. May 61, 37p. incl. illus. table (Technical note no. 1; Rept. no. TCEA TN 4)
(Contract AF 61(052)350)
(AFOSR-1197) Unclassified report

DESCRIPTORS: Airfoils, *Aerodynamic configurations, *Supersonic flow, Supersonics, Gas flow, Laminar boundary layer, Wind tunnel models, Supersonic wind tunnels, *Aerodynamics, Fluid mechanics, France.

In supersonic tunnel tests with a two-dimensional backward-facing step model, span-wise perturbations were found in the reattachment region. Studies were made using the same and other similar models. In these later studies, the same three-dimensional perturbations were detected, into the full thickness of the boundary-layer, after reattachment, both in turbulent and laminar regions of the flow. Their amplitude was a maximum in the transition region. Using a model with a much improved accuracy of manufacture, notably at the leading-edge, it was found that the amplitude of the perturbations was greatly reduced, roughly in proportion to the size of the irregularities of manufacture of the leading-edge itself. It is concluded that the phenomenon is essentially one of instability in the two-dimensional flow, the main triggering action arising from small irregularities in the leading-edge. (Author)

AD-262 037 Div. 9
(25 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
A COOLED-TUBE PYROMETER WITH EXPERIMENTAL RESULTS OBTAINED IN A HIGH-TEMPERATURE GAS STREAM,
by George E. Glawe, Robert C. Johnson, and Lloyd N. Krause. Aug 61, 25p. incl. illus. tables.
(Technical note no. D-870)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-870.

DESCRIPTORS: *Pyrometers, *Heat transfer, Temperature, Calibration, Cylindrical bodies, Measurement, Determination, Mach number, *Instrumentation, *Gas flow, Convection, Specific heat, Density, Velocity, Turbulent flow, Pressure, Combustion, Tests, Reynolds number, Thermocouples, Nitrogen, Exhaust gases, Enthalpy, Thermal conductivity, Laminar boundary layer, Volume, Molecular weight, Aerodynamics, Atmospherics, Air.

An immersion-type pyrometer is described whose primary sensing element is a cylindrical tube in cross flow. The heat-transfer rate to this unit is determined by measurement of the flow rate and temperature rise of a coolant passing through the tube. The heat-transfer rate can then be related to free-stream temperature, after determination of a constant of proportionality by calibration against a reference pyrometer at some convenient lower temperature. Experimental data were obtained in a subsonic exhaust-gas stream over a pressure range of 2/3 to 1-1/2 atmospheres and a temperature range of 1600 to 4400 R. (Author)

AD-262 045 Div. 9
(28 Aug 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
RECOVERY TEMPERATURE, TRANSITION, AND HEAT-TRANSFER MEASUREMENTS AT MACH 5,
by Paul F. Brinich. Aug 61, 51p. incl. illus.
(Technical note no. D-1047)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1047.

DESCRIPTORS: *Heat transfer, Temperature, Measurement, Recovery, *Conical bodies, *Cylindrical bodies, Reynolds number, Mach number, Tests, *Aerodynamic configurations, Instrumentation, Laminar boundary layer, Supersonic flow, Hypersonic flow, *Hypersonic wind

tunnels, Errors, Conductivity, Heat, Schlieren photography, *Supersonic wind tunnels, Hypersonics, Supersonics, Turbulence, Turbulent flow.

Schlieren, recovery temperature, and heat-transfer measurements were made on a hollow cylinder and a cone with axes alined parallel to the stream. Both the cone and cylinder were equipped with various bluntnesses, and the tests covered a Reynolds number range up to 20 x 10 to the 6th power at a free stream Mach number of 4.95 and wall to free stream temperature ratios from 1.8 to 5.2 (adiabatic). A substantial transition delay due to bluntness was found for both the cylinder and the cone. Heat-transfer tests on the cylinder, however, showed only slight effects of wall temperature level on transition location. A comparison of transition locations observed with schlieren, peak recovery temperature, and heat-transfer methods indicated substantial agreement. (Author)

AD-262 067 Div. 9, 25
(29 Aug 61) OTS price $1.60

Politecnico di Torino (Italy).
RESEARCH PERFORMED AT THE INSTITUTE OF APPLIED MECHANICS OF THE POLITECNICO (TORINO) ON MOMENTUM, HEAT AND MASS TRANSFER AND ON FREE MOLECULAR FLOW.
Technical rept.,
by Carlo Ferrari. Apr 61, 16p.
(Contract AF 61(052)208)
(AFOSR 1162) Unclassified report

DESCRIPTORS: *Heat transfer, *Superaerodynamics, Ablation, *Gas flow, Molecules, Boundary layer, Fluid mechanics, Vapor.

Research performed during 1960 is summarized as follows. Work on momentum, heat, and mass transfer at high speed concerns homogeneous gases, gas-vapor mixtures, and evaporative cooling; work on free molecular flow concerns energy exchanges, momentum exchanges, and the relations between interaction coefficients and sitting time of the molecules on the surface.

AD-262 068 Div. 9, 25
(29 Aug 61) OTS price $3.60

Politecnico di Torino (Italy).
SIMULTANEOUS TRANSFER OF MOMENTUM HEAT AND MASS. PART III. EVAPORATIVE COOLING AT HIGH SPEED,
by Gianni Jarre. Apr 61, 1v. incl. illus. tables (Technical note no. 20)
(Contract AF 61(052)208)
(AFOSR 1161) Unclassified report

DESCRIPTORS: *Heat transfer, Ablation, Superaerodynamics, *Gas flow, Molecules, Boundary layer, Fluid mechanics, Vapors, Vaporization, *Evaporation, *Aerodynamic heating, Cooling.

The opposite effects of evaporative cooling and of aerodynamic heating at high speed are investigated. The evaporative cooling is a very effective process to strongly reduce the friction heating produced by high speeds. The wet bulb of a psychrometer describes the adiabatic case of evaporative cooling. The field of low vapour concentration is thoroughly analyzed and simple graphical methods are derived. Numerical examples illustrate the obtained results. The stability of laminar flow under evaporative cooling is eventually discussed. (Author)

AD-262 099 Div. 9, 25
(30 Aug 61) OTS price $4.60

Rome U. (Italy).
MODELING TECHNIQUE FOR HEAT TRANSFER SIMILARITY PROBLEMS AT HIGH SPEEDS,
by Luigi Broglio, Giorgio Ravelli and others.
Jan 61, 47p. incl. illus. (Technical rept. no. 1; SIARgraph no. 57)
(Contract AF 61(052)198)
(AFOSR-1203) Unclassified report

DESCRIPTORS: *Heat transfer, Supersonics, *Guided missiles, Wind tunnels, Wind tunnel models, Hypersonics, *Aircraft, Temperature, Test methods, Instrumentation, Boundary layer, *Aerodynamic heating.

A general method for the analysis of the heat transfer on bodies flying at very high speed is presented. In Part I, a modeling technique relative to the use of the blowdown supersonic and hypersonic wind tunnel to solve the complete similarity problems is given. In Part II, an application of the above technique is presented, and experimental results of turbulent heat transfer coefficients on blunt bodies at Mach Numbers 3.98 and 4.01 are presented. (Author)

AD-262 123 Div. 9
(29 Aug 61) OTS price $12.50

Hayes Aircraft Corp., Birmingham, Ala.
EFFUSION PHENOMENA AS APPLIED TO A LIFTING DEVICE. Final rept. 26 Sep 60-25 Apr 61 on the Effusion Research Program,
by C. M. Askey, U. M. Robinson and A. R. Phillips.
Apr 61, 173p. incl. illus. tables (Engineering rept. no. 595)
(Contract DA 44-177-tc-697)
(TREC TR 61-61) Unclassified report

DESCRIPTORS: *Gas flow, *Lift, Porous metals, Porous materials, Porous glass, Surfaces, Density, Molecules, Test equipment, Test facilities, Theory, Tests, Control, Pressure, Propulsion, *Aerodynamics, Particles, Velocity, Temperature, Partial differential equations, Control panels, Measurement, Instrumentation, Flowmeters, Kinetic theory, Diffusers, Iron, Cadmium, Silver, Glass, Metal plates, Vapor pressure, Metals, Tungsten, Mercury, Vapors, Condensation.

There are no microporous media presently available which will permit an effusion process to take place at atmospheric pressure. Although the production of microporous media with the desired hole diameter is presently obtainable, the production of material with the required thickness is beyond the present state-of-the-art. Even if the thickness requirements could be met, the circuitous nature of the pore channels makes it impossible to achieve effusive flow. The thickness of the microporous media required to test for lift by the effusion process at atmospheric pressure approaches atomic dimensions. Material of this thickness is impractical for the application considered here. The tube model calculation set an upper limit on lift, a limit which is much smaller than the lift predicted. It is believed that the low calculated values of lift combined with the stringent materials requirements for effusion fail to justify a more detailed analysis of the feasibility of producing lift by means of the effusion process. (Author)

Division 9 - FLUID MECHANICS

AD-262 142 Div. 9
(28 Aug 61) OTS price $5.60

Stanford U., Calif.
APPLICATION OF A HYDROCARBON TRACER TECHNIQUE TO GAS PHASE MASS TRANSFER INVESTIGATIONS.
Thesis,
by J. C. Schulz. 1 Aug 61, 56p. incl. illus. tables, 10 refs. (Technical rept. no. 50)
(Contract Nonr-22523, Proj. NR-090-342)
Unclassified report

DESCRIPTORS: *Fluid flow, Hydrocarbons, Gases, Detection, Tracer studies, Transport properties, Jet mixing flow, Velocity, Temperature, Air ejectors, Test methods, Test equipment, Ethanes, Jets, Detectors.

Information regarding the mass transfer occurring in a fluid flow situation is often of interest. Experimentally, mass transfer can be determined through the use of some kind of tracer technique. A particular technique is described involving the use of small concentrations of hydrocarbon gas as a tracer in conjunction with a very sensitive hydrocarbon detector to measure its spread. The detector, utilizes the principle of flame ionization for the detection of hydrocarbons in a sample of the flow. The technique is illustrated by applying it to the case of the turbulent jet mixing in an air-air ejector. Ethane is used as the tracer gas, and measured concentrations for the tests are in the range 0 to 0.04 mole percent ethane. The technique is seen to give meaningful data about the mass transfer occurring in the jet mixing process. Nondimensional concentration profiles are obtained showing the spread of concentration in the mixing region. Comparison with velocity and temperature data obtained by Mitchell indicates that temperature and mass spread alike while the spread of velocity is slower and of a different nature. (Author)

AD-262 145 Div. 9
(25 Aug 61) OTS price $9.10

Stanford U., Calif.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF FLOW OVER SINGLE AND DOUBLE BACKWARD FACING STEPS,
by D. E. Abbott and S. J. Kline, June 61, 106p. incl. illus. tables, 23 refs. (Rept. no. MD-5)
(Contract AF 49(638)201)
(AFOSR-890) Unclassified report

DESCRIPTORS: *Subsonic flow, Turbulent flow, Velocity, Tests, Boundary layer, Mathematical analysis, Reynolds number, Statistical analysis, Jet mixing flow, *Fluid flow, *Hydrodynamics, Test equipment, Transformations (Mathematics), Partial differential equations, Numerical analysis, Shear stresses, Viscosity.

A semi-empirical analysis is developed for the over-all flow pattern of subsonic turbulent flow over backward facing steps. Good agrement is found between theory and experiment for the prediction of two-dimensional reattachment length for small values of step height to throat width ratio; an asymptotic solution for large values of step height is also given and discussed. Mean velocity profiles calculated by the present analysis are shown; they require an empirical fit at one point. Good agreement with experiment is found in the region near the step face, but agreement is poor near the reattachment region. Experimental results are represented for flow patterns over backward facing steps covering a wide range of geometric variables. Velocity profile measurements are given for both single and double steps. The stall region is shown to consist of a complex pattern involving three distinct regions. The double step contains an asymmetry for large expansions, but approaches the single-step configuration with symmetric stall regions for small values of area ratio. No effect on flow pattern or reattachment length is found for a wide range of Reynolds numbers and turbulence intensities, provided the flow is fully turbulent before the step. (Author)

AD-262 230 Div. 9
(31 Aug 61) OTS price $4.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
EFFECT OF BOUNDARY-LAYER GROWTH IN A SHOCK TUBE ON SHOCK REFLECTION FROM A CLOSED END,
by George Rudinger. June 61, 43p. incl illus. tables, 19 refs. (Proj. Squid Technical rept. no. CAL-83-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR 098-038)
Unclassified report

An abridged version was presented at the American meeting of the Physical Society held at Washington, D. C. in April 1961.

DESCRIPTORS: *Shock waves, *Boundary layer, *Shock tubes, Reflection, Ducts, Gas flow, Pressure, Time, Compressible flow, Orifices.

The pressure behind a shock wave propagating in a constant-area duct increases slightly with time as a result of the growing boundary layer. This rise is considerably magnified by the reflection of this shock from the closed end of the duct. Analysis of the local interaction of the reflected shock with the boundary layer yields information on the shock configuration, but the combined effects of the waves produced by the growing boundary layer along the entire shock tube must be considered to obtain the state of the gas behind the reflected shock. An existing theory for computing the flow field behind the incident shock is modified to allow for effects in addition to boundary-layer growth which cause deviations from an ideal shock-tube flow. Standard wave-diagram procedures are simplified to compute the pressure rise behind the reflected shock without having to construct a wave diagram. Experimental observations of the pressure rise behind the reflected shock, obtained for shock pressure ratios up to about 4.5 are in satisfactory agreement with the computed results, and estimates for stronger shock waves are presented. (Author)

AD-262 231 Div. 9
(31 Aug 61) OTS price $1.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
ON THE INTERACTION OF CENTERED EXPANSION WAVES,
by George Rudinger. Aug 61, 12p. incl. illus. tables (Proj. Squid Technical rept. no. CAL-84-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR 098-038)
Unclassified report

DESCRIPTORS: *Gas flow, *Shock waves, Ducts, Specific heat, Mathematical analysis, Wave transmission.

Exact solutions for two cases of reflection of centered expansion waves from a closed end of a duct are presented. It is shown that the reflected wave, in general, is not centered and that its deviation from a centered expansion wave increases rapidly with decreasing ratios of the specific heats. (Author)

10. FUELS AND COMBUSTION

AD-261 508 Div. 10, 4
(21 Aug 61) OTS price $7.60

Armour Research Foundation, Chicago, Ill.
FUNDAMENTALS OF LIQUID PROPELLANT SENSITIVITY.
Final rept. 22 June 60-21 June 61,
by T. A. Erikson and E. L. Grove. 10 Aug 61,
71p. incl. illus. tables (Rept. no. ARF 3180-13)
(Contract NOw 60-0431-c)
Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Rocket oxidizers, Detonation, *Nitroglycerine, Chlorine compounds, Oxides, Sensitivity, Infrared radiation, Photolysis, Photochemical reactions, Shock waves, Oxygen, Argon, Shock tubes, Nitro radicals, Methanes, Ultraviolet radiation, Xenon lamps, Surface properties, Vapor pressure.

Most of the work has involved identifying and controlling the significant experimental variables. It was found that sufficient time must be allowed for a liquid-vapor equilibrium to be reached in the shock tube in order to obtain consistent results with nitroglycerine samples. O shocks in the range of Mach 3.7 will then cause the detonation of nitroglycerine within 0 to 1000 microseconds after the shock has been reflected from the surface of the sample. O or Ar shocks in the range of Mach 3 will cause the detonation of C1207 within 100 microseconds. Apparently, UV radiation does not cause the detonation of nitroglycerine, while IR radiation is quite effective. (Author)

AD-261 531 Div. 10, 27
(21 Aug 61) OTS price $11.50

Lockheed Aircraft Corp., Marietta, Ga.
MAIN PROPELLANT TANK PRESSURIZATION SYSTEM STUDY AND TEST PROGRAM.
Semiannual progress rept. no. 2, 1 Jan-30 June 61.
Aug 61, 147p. incl. illus. tables (Engineering rept. no. ER-5238)
(Contract AF 04(611)6087)
(FTRL-TOR 61-23) Unclassified report

DESCRIPTORS: *Propellant tanks, *Pressure tanks, *Liquid rocket propellants, Rocket oxidizers, Rocket fuels, Fuel injection, Fuel systems, Evaporation, Liquefied gases, Hydrogen, Nitrogen, Oxygen, Helium, Hydrazines, Fluorides, Bromine compounds, Pentaborane, Chlorine compounds, Nitrogen compounds, Tetroxides, Methyl hydrazines, Combustion, Detonation, Cryogenics, Tests, Pressure, Gases.

A discussion is presented on the evaporated propellant (EP) and main tank injection (MTI) systems for main propellant tank pressurization. Results of testing with liquid H, liquid N, UDMH, NTO (N2O4), N2H4, 50-50 UDMH/N2H4, RP-1, BrF5, C1F3 and B5H9 are presented. The MTI method of tank pressurization is believed feasible for the following combinations: NTO into UDMH; NTO into 50-50 UDMH/N2H4; UDMH into NTO; 50-50 UDMH/N2H4 into NTO; N2H4 into NTO; C1F3 into B5H9. The EP method appears practical for liquid H, liquid O and NTO, while the MTI method appears practical for the combination NTO and 50-50 UDMH/N2H4, and NTO and UDMH in either the fuel or oxidizer tank.

AD-261 540 Div. 10
(21 Aug 61) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
THE BURNING CHARACTERISTICS OF A MAGNESIUM-BASED SOLID FUEL FOR RAMJETS,
by William F. Hassel. Apr 61, 14p. incl. illus. tables (NOTS TP 2681)
(NAVWEPS rept. no. 7656) Unclassified report

DESCRIPTORS: *Ramjet engines, Combustion, Pressure, Air, Gas flow, Temperature, Mach number, Magnesium, Nitrates, Sodium compounds, *Solid jet engine fuels, Jet engine fuels, Feasibility studies, Fuel consumption.

The burning-rate data on a large number of magnesium-based ramjet solid-fuel charges were analyzed to determine what factors in the test situation influence the burning rate. The charges were internal-burning, hollow cylinders. The burning rate is shown to increase linearly with combustion pressure, to decrease at high inlet-air temperature, and to increase with airflow Mach number over the burning surface. Curves were constructed that permit estimation of the burning rate as a function of pressure and internal Mach number. (Author)

AD-261 548 Div. 10
(21 Aug 61) OTS price $1.10

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Bimonthly progress rept. no. 2,
by Rex Ratchford and G. D. Kittredge. May 61,
9p. incl. illus. tables. (Research Division rept. no. 2935-61R)
(Contract NOw 61-0590-d)
Unclassified report

DESCRIPTORS: *Jet engine fuels, Sulfur compounds, Sulfides, Thiols, Butyl radicals, Organic compounds, Stability, Chemical impurities, Deterioration.

The effects were studied of jet fuel sulfur content on thermal stability of jet fuels, as determined by the ASTM-CFR Fuel Coker test. Representative types of pure sulfur compounds blended at the present maximum allowable specification concentrations in a representative JP-5 type kerosine base fuel were studied. The thermal stability performance indicated that this JP-5 type fuel could tolerate sulfur at levels of 0.4 wt % total sulfur or 0.001 wt % mercaptan sulfur with all compounds tried without actually failing the test, though several had measurable adverse effects. Strong adverse effects on thermal stability performance with ditertiary butyl disulfide were eliminated when this material was redistilled before addition to the base fuel. Analyses of the bottoms fraction from this distillation showed 38 ppm of soluble Cu plus unidentified oxygenated impurities. (Author)

AD-261 589 Div. 10
(5 Sep 61) OTS price $8.60

Princeton U., N. J.
COMPARISON OF SOLID PROPELLANT BURNING RATES IN STRANDS AND ROCKET MOTORS.
Technical rept.,
by Clarke E. Hermance. May 61, 99p. incl. illus. tables, 17 refs. (Aeronautical Engineering Lab. rept. no. 556)
(Contract Nonr-185832, Proj. NR 098-201; In

cooperation with James Forrestal Research Center, Princeton U., N. J., Contract Nonr-185825, Proj. NR-098-038)
(ARPA order no. 23-59; 23-60) Unclassified report

DESCRIPTORS: *Solid rocket propellants, Combustion, *Rocket motors, Thermal radiation, Feedback, *Propellant grains, Surfaces, Determination, Design, Pressure, Theory, Combustion chamber gases, Test equipment, Mathematical analysis, Velocity.

The burning rate of a composite, solid propellant in a rocket motor was compared with results of research on the burning rate of a strand of composite, solid propellant which led to a theoretical burning rate law. The role of radiative energy feedback to the propellant surface was of special interest. A rocket motor incorporating interchangeable grains, and interchangeable nozzles, which allowed progressive burning between various pressure levels, was developed. In general, the burning rate in the rocket motor at any specified pressure was less than that of a strand burning at the same pressure. The energy feedback due to the presence of radiative heat flux, and its effect on the burning rate in a rocket motor, was investigated. In particular, the radiation flux from the central gas column incident upon the propellant surface was theoretically computed. Preliminary experimental results showed the radiation flux from the hot gas column to the propellant surface to be approximately twice that received from the flame zone. (Author)

AD-261 738 Div. 10, 4
(25 Aug 61) OTS price $3.60

Air Products, Inc., Allentown, Pa.
STUDY OF LIQUID OXYGEN CONTAMINATION.
Progress rept. no. 5,
by R. H. Foster, W. vanGelder, and E. Kehat.
Oct 60, 37p. incl. illus. tables.
(Contract AF 33(616)6730)
Unclassified report

DESCRIPTORS: *Oxygen, *Liquefied gases, *Liquid rocket propellants, Contamination, Purification, Chemical impurities, Specifications, Carbon dioxide, Solidified gases, Hydrocarbons, Films, Ignition, Fuel filters, Handling, Safety, Rocket oxidizers.

An investigation of hydrocarbon film ignition was started. Hexadecane was deposited on films of different thicknesses upon the inner wall of a section of 1-in. stainless steel pipe. Ignition was attempted with an electric spark and duPont electric match. The spark method proved more favorable. Tentative results from these first series of tests point to a safe upper limit for hydrocarbon film thickness greater than the 4000 micrograms/sq ft. A program was initiated for determining the filtration characteristics of solid CO2 from liquid oxygen. A system of liquefaction, filtration, and analysis of LOX was set up and test runs were started. The data show an apparent effect of the Reynolds Number (effectively = liquid velocity) of the liquid at the surface of the filtering medium. The concentration of the CO2 in the filtrate remains in the filtrate. This amount, approximately the solubility limit, will precipitate out of solution as the LOX is handled further or vaporized while in storage. (Author)

AD-261 742 Div. 10
(30 Aug 61) OTS price $2.60

Instituto Nacional de Tecnica Aeronautica (Spain).
SOME CONTRIBUTIONS TO LAMINAR FLAME THEORY,
by Gregorio Millan and Ignacio Da Riva. 1960, 23p.
(Contract AF 61(514)221)
(AFOSR-41) Unclassified report

Preprint of paper to be read at the Second International Congress of the ICAS Zurich, Switzerland, September 12-16, 1960.

DESCRIPTORS: *Flames, *Combustion, Theory, Boundary layer, Heat, Mathematical analysis.

The cases considered in this study and the results obtained are the following: (1) Flame with heat loss localized at the stabilizer. It is shown that the two velocities of Hirschfelder reduce to only one, by means of the choice of the adequate parameter, pointing out the apparent contradiction between Spalding's experimental results and the theoretical conclusions. (2) Flame with distributed heat losses. It is shown that the two velocities of Spalding reduce to only one by varying slightly the boundary conditions at the hot limit, both when an ignition temperature at the cold boundary is assumed as well as when the porous stabilizer of Hirschfelder is used. This result is particularly significant when the activation energy is different from zero, because then such modification is made imperceptible and the lower of both velocities is very small. (3) Finally, as a new cause of disturbance, for the same flame model, the effect of a dilution of the mixture produce by the lateral diffusion of the active species, is considered, obtaining the result that the dilution diminishes the flame velocity, which vanishes for a limit value of the lateral diffusion coefficient. (Author)

AD-262 104 Div. 10, 4
(29 Aug 61) OTS price $1.50

Inglewood Lab., Thompson Products, Inc., Indiana.
STUDY OF PHYSIOCHEMICAL PROPERTIES OF COMMERCIAL SAMPLES OF ISOPROPHYLDICYCLOHEXYL AND DIETHYLCYCLOHEXANE.
Rept. for Feb-Dec 58 on Aviation Fuels,
by E. Findl, H. Brande, and H. Edwards. Nov 60, 46p. incl. illus. 14 refs.
(Contract AF 33(616)5587, Proj. 3048)
(WADD TR 60-766) Unclassified report

DESCRIPTORS: *Cyclohexanes, *Jet engine fuels, Test methods, Test equipment, Specific heat, Vaporization, Density, Vapor pressure, Enthalpy, Entropy, Tests, Physical properties, Determination, Thermodynamics, Combustion, Ethyl radicals, Propyl radicals, Aviation fuels.

Commercial samples of isoprophyldicyclohexyl (IDH) and diethylcyclohexane (DCH) were studied in respect to density-temperature relationships over the range 0 - 500 F; liquid specific heats over the range 100 - 500 F; heats of vaporization; vapor pressure-temperature relationships; entropy-temperature relationships; and gross heats of combustion. (IDH) is quite similar to fuels meeting the RJ-1 specification in most of its thermodynamic properties. Its distillation range is considerably less for DCH than a-JP-6H fuel. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-261 968 Div. 11
(29 Aug 61) OTS price $4.60

Army Transportation Board, Fort Eustis, Va.
SERVICE TEST OF ROUGH TERRAIN FORKLIFT TRUCK, 15,000-LB.
Rept. of Proj. no. TCB-16-107-ST.
1961, 44p. incl. illus. (Rept. no. TCB-61-107-ST)
Unclassified report

DESCRIPTORS: *Fork lift vehicles, Terrain, Tests, Effectiveness, Reliability.

Service tests were made: (1) To determine the suitability of the test item in performance of its mission as material handling equipment for use under adverse conditions; (2) To obtain operational and maintenance data for evaluating the performance of the vehicle; (3) To determine possible design deficiencies and recommend corrective action, if necessary; (4) To determine whether the item is suitable for adoption through type classification action. Furnish justification if adoption is not recommended; and (5) To afford field units an opportunity to offer suggestions for improvement on future models based on operating experience with the vehicle while performing tasks within the scope of the vehicle's military mission. The results indicate conclusively that the 15,000 lb Rough Terrain Forklift can adequately perform the mission it was designed for. The test further indicated that this item would be a very valuable asset to the Transportation Corps in the accomplishment of its mission in an active theater of operations. That the tested item is entirely compatible with established military characteristics within the range of the tests performed and is suitable for use by the Armed Forces. (Author)

12. GUIDED MISSILES

AD-261 505 Div. 12
(21 Aug 61) OTS price $1.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
LAUNCH NOISE DISTRIBUTION OF NIKE-ZEUS MISSILES,
by Harold S. Springer and Robert O. Olsen.
July 61, 17p. incl. illus. table (Special rept. no. 53)
Unclassified report

DESCRIPTORS: *Guided missiles, Guided missile launchers, *Launching, *Noise, Sound transmission, Meteorology, Instrumentation, Blast, Hazards, Launching sites, Injuries, Tests, Guided missile personnel, Surface to air, Safety, *Rocket motor noise, Test facilities, Measurement, Ear.

Maximum sound pressure levels averaging 115 decibels, with extreme values of 90 and 128 decibels, were measured about one mile behind the Nike Zeus Missile Launcher for the variety of meteorological conditions occurring during four monthly tests. Additional small samples of data taken both near the launcher and at two miles distance from the sound source suggest a 20-decibel decline in peak noise level per mile. The decay of the noise level following peak was between two and three decibels per second for the first ten seconds. A frequency analysis of the sound level measured at launch indicates that frequencies below 125 cps are predominant. Under most meteorological conditions, the sound pressure levels at one mile behind the launcher would not be great enough to cause any structural damage or personnel injury. The levels would be above 90 decibels however, which approach the level at which complaints of annoyance become frequent. (Author)

AD-261 670 Div. 12, 6, 30
(23 Aug 61) OTS price $17.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
LUNAR TRAJECTORY STUDIES.
Final rept. July 60-June 61,
by A. Petty, I. Jurkevich, and others. June 61, 276p. incl. illus. tables.
(Contract AF 19(604)5863)
(AFCRL-507) Unclassified report

DESCRIPTORS: *Lunar probes, *Satellite vehicle trajectories, *Radar tracking, Determination, Radar ranges, Celestial mechanics, *Programming, Differential equations, Digital computers, Taylor's series, Tables, Mathematical computer data.

A description of several related IBM-7090 Fortran computer programs is presented to provide a fast, accurate, and systematic procedure for determining initial conditions to the differential equations of motion from tracking data, lunar and interplanetary trajectories in n-body space, and satellite ephemeris compilations. (Author)

AD-261 702 Div. 12, 9
(22 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC WIND-TUNNEL TESTS OF AN ERROR-COMPENSATED STATIC-PRESSURE PROBE,
by Francis J. Capone. Aug 61, 15p. incl. illus. (Technical note no. D-961)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-961.

DESCRIPTORS: *Pressure, Rotating structures, Transonic wind tunnels, *Guided missile noses, Wind tunnel models, Tests, Errors, Cylindrical bodies, Pitot tubes, *Measurement, Pressure gages, Guided missiles, *Aerodynamics.

An investigation of the pressure-sensing characteristics of an error-compensated static-pressure probe mounted on the nose section of a missile body has been conducted in the Langley 16-foot transonic tunnel. The probe was free to rotate about its roll axis and was equipped with a vane so that the crossflow velocity component due to angles of attack or sideslip was always alined with the probe's vertical plane of symmetry. The probe was tested in five axial positions with respect to the missile nose at Mach numbers from 0.30 to 1.08 and at angles of attack from -2.7 degrees to 15.3 degrees. The test Reynolds number per foot varied from 1.79 x 10 to the 6th power to 4.05 x 10 to the 6th power. Results showed that at a Mach number of

1.00 the static-pressure error decreased from 3.5% to 0.8% of the free-stream static pressure, as a result of a change in orifice location from 0.15 maximum missile diameter to 0.20 maximum missile diameter forward of the missile nose. Although compensation for pressure-sensing errors due to angles of attack up to 15.3 was maintained at Mach numbers from M equals 0.30 to M equals 0.50, there was an increase in error with an increase in angle of attack for Mach numbers between M equals 0.50 and M equals 1.08. (Author)

AD-261 788 Div. 12, 1, 27, 21, 25
(22 Aug 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AVIATION TODAY AND TOMORROW (SELECTED PARTS)
(Letectvi Dnes A Zitra),
by Pavel Benes and Jaromir Schindler. 20 June 61, 35p. incl. illus. table (Trans. no. MCL-938 of Nakladatelstvi Mlada Fronta, Praha, pp. 317-329, 351-355, 378-382, 1959)
Unclassified report

DESCRIPTORS: *USSR, Technological intelligence, *Nuclear propulsion, *Airplanes, Nuclear power plants, Design, *Spaceships, Propulsion, *Electric propulsion, Plasma physics, Photons, Gravity, Space flight, Fuels, *Satellite vehicles, Ion rockets.

AD-261 822 Div. 12, 16
(22 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE FIRST MANNED SPACE FLIGHT.
27 July 61, 25p. incl. illus. (Trans. no. MCL-1148 of Pravda 115 (15605), pp. 1, 3 and 4, 25 Apr 61)
Unclassified report

DESCRIPTORS: *Space flight, Manned, *USSR, *Spaceships, *Space medicine.

AD-261 823 Div. 12, 16
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MAN AND SPACE,
by N. Sisakyan. 27 July 61, 6p. (Trans. no. MCL-1149 of Pravda 85 (15575), p. 6, 26 Mar 61)
Unclassified report

DESCRIPTORS: *Space flight, Manned, *USSR, *Closed-cycle ecological systems, Experimental data, Weightlessness, Cosmic rays, *Space medicine, Laboratory animals.

AD-261 825 Div. 12, 16
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FIVE HOURS WITH YURIY GAGARIN,
by P. Barshev and V. Peskov. 27 July 61, 7p. (Trans. no. MCL-1151 of Komsomol'skaya Pravda, p. 4, 15 Apr 61)
Unclassified report

DESCRIPTORS: *Space flight, Manned, *USSR, Astronautics.

AD-261 826 Div. 12, 16
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FIRST FLIGHT OF MAN INTO SPACE.
27 July 61, 10p. incl. illus. (Trans. no. MCL-1152 of Ekonomicheskaya Gazeta, 98 (951), p. 3, 23 Apr 61)
Unclassified report

DESCRIPTORS: *Space flight, *Spaceships, Manned, Preparation, Spaceship cabins, *USSR, Instrumentation, Closed-cycle ecological systems, Space medicine.

AD-261 963 Div. 12, 2
(18 Aug 61) OTS price $3.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
AEROBEE AA 3.145 (AF69).
Meteorological data rept.,
by Gordon L. Dunaway. July 61, 32p. incl. tables.
Unclassified report

DESCRIPTORS: *Guided missile trajectories, Landing impact, *Terminal ballistics, Meteorology, *Meteorological data, *Guided missiles, Launching, Ballistics.

Meteorological data gathered for the launching of Aerobee AA 3.145 (AF-69) are presented for ballistic studies. The data appear in this report, along with calculated ballistic data, in Appendices A, B, C, and D. (Author)

AD-261 964 Div. 12, 2
(18 Aug 61) OTS price $3.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
AEROBEE-100 NASA 1.04 AND NASA 1.06.
Meteorological data rept.,
by Frank C. Harrison and Paul H. Taft. July 61, 35p. incl. tables.
(In cooperation with Army Signal Rocket Support Activity (Arctic) and Army Signal Missile Support Agency, Fort Churchill, Manitoba, Canada)
Unclassified report

DESCRIPTORS: *Guided missile trajectories, Landing impact, *Terminal ballistics, Meteorology, *Meteorological data, *Guided missiles, Launching, Ballistics.

Meteorological data for Aerobee-100 NASA 1.04 and 1.06 were collected by the Meteorological Branch, U. S. Army Signal Rocket Support Activity (Arctic), U. S. Army Signal Missile Support Agency. The data were taken prior to and during the firings and appear along with calculated ballistic data in Appendices A, B, C, and D. (Author)

AD-261 965 Div. 12, 30
(28 Aug 61) OTS price $1.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
AFSWC BLUE SCOUT JUNIOR PROGRAM FOR 1962,
by Richard Kaufmann. Aug 61, 14p. 14 refs.
(AFSWC TN 61-27)
Unclassified report

DESCRIPTORS: *Space probes, Space environmental conditions, Research test vehicles, Turbulence, Measurement, Instrumentation, *Turbulent boundary layer, Solar disturbances, Magnetic fields, Plasma physics, Solar energy, *Satellite vehicles, Scientific research, Air force research, Magnetometers, Magnetohydrodynamics.

The Air Force space physics program is designed to determine certain properties of the region above the earth's atmosphere that have important military implications. The Blue Scout Junior Program for 1962 is intended to investigate the nature of turbulence at altitudes up to 100,000 km. The instrumentation is described which is needed to study the turbulent region and the responses expected from these instruments. The relationship between this program, the entire AFSWC high altitude program, and NASA's high altitude program is also discussed. (Author)

AD-262 023 Div. 12
(28 Aug 61) OTS price $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TERMINAL GUIDANCE OF A LUNAR PROBE,
by C. R. Gates. 14 May 58, 16p. incl. illus.
(External publication no. 506)
(Contract DA 04-495-ORD-18, ORDCIT Proj.)
Unclassified report

DESCRIPTORS: *Lunar probes, *Guidance, Landing, Mathematical analysis, Moon, Landing aids, Radio altimeters, Landing impact, Inertial guidance.

The problem of guiding a lunar probe to a zero-velocity or soft landing the moon is discussed. A self-contained guidance system is proposed, and measurement instruments and accuracies, guidance computer transfer functions, and the magnitude and control of impulse required in the terminal maneuver are treated. It is concluded that guidance in two stages, lateral guidance at a point some 5,000 miles above the surface using optical and inertial instruments as error sensors, and braking along the path near the surface of the moon using a radio altimeter as an error sensor, is feasible. Existing components and techniques are adequate to perform these functions; aside from weight reduction, no new developments are needed. (Author)

AD-262 138 Div. 12
(29 Aug 61) OTS price $4.60

Space Technology Labs., Inc., Los Angeles, Calif.
A LABORATORY INVESTIGATION OF A DIGITAL AUTOPILOT,
by A. A. Sorenson, May 61, 46p. incl. illus. tables (Rept. no. 7203-0003-RU-000)
(Contract AF 04(647)619)
(AFBMD TR 61-73) Unclassified report

DESCRIPTORS: *Automatic pilots, *Control systems, *Guided missiles, *Digital systems, Electronic circuits, Design, Power supplies, Analog-to-digital converters, Coding, Gyroscopes, Guidance, Reliability.

The philosophy and design is presented of a digital autopilot system which was developed under control systems studies, project plan 165-35. The general design and the intended performance characteristics of the system are explained. Included are detailed block diagrams, individual schematics of the various types of circuits as well as some remarks about reliability. A control system of greater accuracy, lighter weight, smaller size, reduced power requirements, and greater potential reliability is needed. This particular system offers one possible solution to the search for such a control system. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-261 566 Div. 13, 2
(21 Aug 61) OTS price $9.60

Armour Research Foundation, Chicago, Ill.
DESIGN AND ANALYSIS OF FOUNDATIONS FOR PROTECTIVE STRUCTURES.
Interim technical rept. no. 2,
by K. E. McKee. May 61, 118p. incl. illus. tables, 18 refs. (ARF rept. no. 8193-15)
(Contract AF 29(601)2561, Proj. 1080)
(AFSWC TN 61-14) Unclassified report

DESCRIPTORS: *Shelters, Design, Load distribution, Sand, Tests, Soils, Structures, Clays, Nuclear explosions, Blast, *Air raid shelters, Battle shelters, Civil engineering, Plasticity, Failure (Mechanics), Test equipment, Dynamics, Stresses, Hydraulic systems, *Foundations (Structures).

The behavior of footings subjected to time-dependent forces is discussed. Research is concerned with the experimental results and comparisons to the theoretical approaches. Two- and three-dimensional footings on Ottawa sand were loaded dynamically using special loading apparatus and instrumentation. The 2-dimensional experiments permitted observation of the behavior on loose and dense sand subjected to vertical, inclined, and eccentric dynamic loads. The 3-dimensional experiments provided force-time and displacement-time records of the behavior on dense sand of vertically loaded footings. These experiments demonstrate that the theories developed previously are not satisfactory. In an attempt to consider additional soils, California sand and clays were studied. A series of static loadings of 3-dimensional footings were conducted on California sand. Static and dynamic loads were applied to 2-dimensional footings on clay. It was established that the static loads were truly static by experiments conducted at low rates of loading. (Author)

AD-261 789 Div. 13, 18, 33
(22 Aug 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PRINCIPLES OF GEOCRYOLOGY (Osnovy Geokriologii (Merzlotovedeniya).
26 July 61, 91p. incl. illus. table (Trans. no. MCL-942 of Izdatel'stvo Akademii Nauk SSSR, Moskva, pp. 231-266, 1959)
Unclassified report

DESCRIPTORS: *Roads, *Landing fields, USSR, *Transportation, Permafrost, Deformation, Alaska, Underground structures, Mathematical analysis, Climatic factors, *Construction, *Railroads.

Division 13 - INSTALLATIONS AND CONSTRUCTION

AD-261 916 Div. 13, 25
(25 Aug 61) OTS price $16.00

Massachusetts Inst. of Tech., Cambridge.
THE DYNAMIC BEHAVIOR OF REINFORCED CONCRETE COLUMNS,
by Cheng Y. Yang, Saul A. Nuccitelli, and C. N. Tang. Sep 60, 247p. incl. illus. tables, 30 refs.
(Contract DA 49-146-xz-015)
(DASA-1197) Unclassified report

DESCRIPTORS: Mechanics, Applied mechanics, *Beams, *Reinforced concrete, Concrete, Steel, Reinforcing steel, Stresses, Deformation, Theory, Elasticity, Plasticity, Mathematical analysis, Wave transmission, Design, Test equipment, Test methods, Tests, Deflection, Load distribution, Dynamics, Civil engineering.

A theoretical and experimental investigation was made of the dynamic behavior of reinforced concrete columns. A lumped mass and spring system was established for the theoretical investigation. The springs of the system were assumed to have elastic, plastic and viscous properties. The dynamic response of this lumped mass system was solved for some actual pulses and an idealized pulse. Ultimate dynamic loads for plain concrete columns were determined according to an excessive strain criterion of failure. Experiments were performed on 108 columns of which 26 were loaded statically and 82 dynamically. Comparison of ultimate dynamic loads of all tested columns to the corresponding predicted values from existing design formulas was made. For plain concrete columns, ultimate dynamic loads predicted by the present theory were also compared with values from experimental results and from design formulas. In general, these results were in good agreement. (Author)

AD-261 997 Div. 13, 7
(28 Aug 61) OTS price $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
PERFORMANCE LIMITS OF MULTISTAGE THERMOELECTRIC DEVICES,
by Irving I. Sochard. 28 July 61, 33p. incl. illus. table, 7 refs. (DOFL rept. no. TR-947)
(Proj. 31200)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Generators, *Refrigeration systems, Temperature, Heat engines, Mathematical analysis, Effectiveness, *Cooling.

A simplified method of calculating the performance limits of multistage thermoelectric devices is presented and the results obtained for the multistage devices are compared with those for single-stage devices. The results indicate that at present there is little advantage in using more than one stage in a thermoelectric generator. In the case of a thermoelectric refrigerator, however, a small feasible multistage device should be able to produce temperature reduction about twice as great as that obtainable with a single-stage device. Using presently available materials, this corresponds to a maximum temperature reduction approximating 135 C for the multistage device. It is also shown that even if materials are substantially improved, it will probably never be feasible to construct a thermoelectric refrigerator that can cool to cryogenic temperatures while operating from room temperature ambient. (Author)

AD-262 046 Div. 13, 10
(28 Aug 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
ORBITAL STORAGE OF LIQUID HYDROGEN,
by J. R. Olivier and W. E. Dempster. Aug 61, 69p. incl. illus. 11 refs. (Technical note no. D-559)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA technical note D-559.

DESCRIPTORS: *Fuel storage tanks, Liquefied gases, Orbital flight paths, Extraterrestrial bases, Satellite vehicles, Propellant tanks, Satellites, Configuration, *Hydrogen, Design, Storage.

The influence of various design parameters on the storage time of liquid H in space is discussed. Emphasis is placed on non-vented storage of subcooled liquid H in a low geocentric orbit (300 n. mi.). The non-vented storage concept has economical and technological advantages over the vented tank concept. However, for extended non-vented storage periods, the liquid H must be subcooled prior to launch. A spherical tank is considered the optimum shape from a heat transfer standpoint. However, this report is based on an 18-ft.-diam cylindrical tank with hemispherical bulkheads. This coincides with the diameter of the S-IV stage of the Saturn vehicle. The calculations to determine storage times should be based on the assumption of having stagnant fluid conditions in the orbiting tank in order to obtain conservative results. The calculations should further consider the fundamental differences in thermal environment of a vehicle tank, which is an integrated structural element, and an orbital storage tank, which is an individual structure except for the duration of powered flight. (Author)

AD-262 107 Div. 13
(29 Aug 61) OTS price $3.60

Illinois U., Urbana.
BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS. PART 1. SUMMARY OF INVESTIGATION.
Final rept., pt. 1.
Apr 61, 26p.
(Contract AF 29(601)468, Proj. 1080)
(AFSWC TR 59-72, pt. 1) Unclassified report

DESCRIPTORS: *Beams, *Reinforced concrete, Reinforcing steel, Stresses, *Steel, Concrete, Deflection, Load distribution, Deformation, Strain gages, Failure (Mechanics), Fracture (Mechanics), Tests, Mechanical properties, Impact shock, Dynamics, Mechanics, Plasticity, Box beams, Shear stresses, Test methods, Mathematical analysis, Theory, Construction, Design, Moments, Structures, Nuclear explosions, Blast.

Contents:
Static tests of reinforced concrete deep beams with web and compression reinforcement
Static tests of reinforced concrete deep beams without web reinforcement
Dynamic tests of reinforced concrete deep beams
Resistance and behavior of reinforced concrete beams of normal proportions under rapid loading
The yield strength of intermediate grade reinforcing bars under rapid loading
Behavior of deep steel I-shaped beams under slowly applied uniform load

14. MATERIALS (NON-METALLIC)

AD-262 108 Div. 13, 17
(29 Aug 61) OTS price $7.60

Illinois U., Urbana.
BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS. PART VII. PLASTIC BEHAVIOR OF DEEP STEEL BEAMS INCLUDING SHEAR EFFECT,
by William Egger. Mar 61, 75p. incl. illus. 13 refs.
(Contract AF 29(601)468, Proj. 1080)
(AFSWC TR 59-72, vol. 7) Unclassified report

DESCRIPTORS: *Beams, *Steel, Deformation, Deflection, Shear stresses, Moments, Plasticity, Mechanical properties, Tests, Test methods, Load distribution, Failure (Mechanics), Structures, Design, Stresses, Nuclear explosions, Blast.

An investigation was made of the static resistance-deformation relationship of steel I or WF beams subjected to a uniform loading that results in inelastic shear and flexural deformations. Four specimens from as-rolled 8 WF 35 beams were tested; the flange width was reduced for each of the beams in order to obtain the desired variations in resistance. Plastic shear deformations occurred in all specimens. One specimen deformed primarily in flexure, another deformed primarily in shear, and the third deformed from a combination of shear and flexure. Material properties in both tension and torsion were determined from coupon tests. Comparison of the experimental results from the beam tests with the torsional properties of the material indicated that a considerable portion of the shear resistance is contributed by the flanges. A shear-moment interaction relationship is derived which defines the perfectly plastic condition. (Author)

AD-262 195 Div. 13, 25
(29 Aug 61) OTS price $3.60

Technische Hochschule, Hannover (Germany).
THIN-WALLED COMPRESSION MEMBERS,
by A. Pflueger. Mar 61, 33p. incl. illus. (Technical rept. no. 3)
(Contract AF 61(052)365)
(AFOSR-1160) Unclassified report

DESCRIPTORS: *Buckling, Structures, *Beams, Stresses, Germany, Tests, Mathematical analysis, Flanges, Temperature, *Plasticity, *Deformation, *Elasticity, Plastic flow, Creep.

Research was concerned with the postbuckling behavior of thin-walled columns. The instability in the elastic and plastic range was considered in Reports Nr. 1 and 2, Contract AF 61(514)-1140, (AD-212 923, AD-227 149). Further the effect of elevated temperature on buckling was investigated. The ultimate or crippling strength of thin-walled columns, the Euler buckling strength of locally buckled columns, and the failure load of angle sections were determined experimentally. Graphs were prepared to provide for an easy application of the results. A method was proposed for approximately determining the buckling loads of columns at raised temperatures by properly reducing the values at room temperature. These considerations were based on test results taken from the available literature. (Author)

AD-261 549 Div. 14, 26
(21 Aug 61) OTS price $.75

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
STATE OF THE ART. METHODS OF BONDING FLUOROCARBON PLASTICS TO STRUCTURAL MATERIALS,
by Marjorie C. St. Cyr. May 61, 22p. incl. illus. tables, 34 refs. (Plastec rept. no. 6)
Unclassified report

DESCRIPTORS: *Plastics, *Resins, Elastomers, Polymers, Ethylenes, *Fluorocarbons, Fluorides, Plastic coatings, *Adhesives, Adhesion, *Bonding, Epoxy resins, Heat resistant polymers, Metal coatings, Sodium compounds, Naphthalenes, Vinyl radicals, Furans, Heating, Preparation, Melting, Resin adhesives, *Bibliography.

For the bonding of fluorocarbon plastics to themselves and to other substrates, probably the most common method involves the application of an etching solution which modifies the surface of the plastic, making it receptive to conventional adhesives. The advent of the new melt-processible Teflon FEP fluorocarbon makes possible structural bonding without the use of conventional adhesives. The simultaneous application of heat and pressure is sufficient to produce an adhesive bond between the FEP plastic and other materials by using a film of FEP plastic as the bonding agent. The surface of a fluorocarbon plastic may also be made receptive to adhesive bonding by applying a specialty coating of a monomer and subsequently subjecting the coated fluorocarbon to ionizing radiation. The two general methods of bonding fluorocarbon plastics to themselves or to other materials are: bonding treated fluorocarbons by the use of adhesives, and melt bonding. (Author)

AD-261 550 Div. 14
(21 Aug 61) OTS price $1.25

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
THE APPLICATION OF NONDESTRUCTIVE TESTING TO PLASTICS,
by Alfred M. Anzalone. July 61, 39p. (Plastec note no. 1)
Unclassified report

DESCRIPTORS: *Plastics, *Non-destructive testing, Test methods, *Bibliography, Ultrasonics, Quality control, Creep, Dielectric properties, Penetration, Radiography, X-ray photography, Vibration, Dyes, Isotopes, Radioactive isotopes, Test equipment.

The literature was searched for documents which provide information on nondestructive testing techniques as applied or which are applicable to plastics. In a field of effort in which the past few years have seen marked advances, this search must be considered a status-report. The items located fall roughly into two groups: those techniques which involve ultrasonics and those which do not. This has given basis for the method of presentation, in which Part I covers 25 references on the non-ultrasonic techniques and Part II presents 16 references on the non-ultrasonic approaches. Other related information not available in report form is presented in Part III. (Author)

Division 14 - MATERIALS (NON-METALLIC)

AD-261 587 Div. 14, 4
(21 Aug 61) OTS price $1.10

Harris Research Labs., Washington, D. C.
ACCELERATED DETERIORATION OF TEXTILES.
Bimonthly progress rept. no. 2, 1 June-31 July 61, by Charles A. Rader and Anthony M. Schwartz, 15 Aug 61, 7p. incl. table.
(Contract DA 18-108-cml-6606)
Unclassified report

DESCRIPTORS: Textiles, Deterioration, *Cotton textiles, Light, Measurement, Intensity, *Cellulose, Radiation effects, Dosimeters, Impregnation, Iron compounds, Nitrates, Photochemical reactions, Catalysts, Oxidation, Tensile properties.

Cellophane sheets were uniformly impregnated with ferric nitrate to ferric ion contents of 0.1% and 0.2%. Single sheets were exposed to radiation from a carbon arc, filtered to exclude light below 2900 A, and consisting primarily of light between 3500 and 5000 A. Untreated cellophane was used as the control. Exposures up to 15 hours produced no measurable loss in tensile strength for the treated or untreated sheets. A 36 hour exposure caused about 35% strength loss in the sheets containing 0.2% ferric ion, but no measurable strength loss in the untreated sheets or in those containing 0.1% ferric ion. Swatches of cotton fabric were similarly impregnated with ferric nitrate and exposed. Untreated fabric was used as the control. In contrast to cellophane, the ferric ion impregnated cotton was significantly degraded by exposure times as short as ten hours. 36 Hour exposure caused severe loss in the material containing 0.2% ferric ion, and some loss even in the untreated control. Thus it appears that cellophane may be more resistant than cotton to catalyzed photooxidative degradation, even though both are essentially cellulose. The current studies are being extended to explain this behavior. An actinometer system based on uranyl oxalate was set up and calibrated. (Author)

AD-261 776 Div. 14
(22 Aug 61) OTS price $8.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PLASTICS (SELECTED ARTICLES).
27 Feb 61, 84p. incl. tables (Trans. no. MCL-728 of Plasticheskiye Massy 1:pp. 3-9, 34-49, 1959)
Unclassified report

DESCRIPTORS: *Plastics, Production, *Resins, Industrial production, *Polymers, Manufacturing methods, Extrusion, Preparation, Chemical properties, Physical properties, Mechanical properties, Heat-resistant polymers, Electrical properties, *Adhesives, Urethane, Epoxy resins, Epoxides, Acrylic resins, Phenolic resins, Research program administration, Formaldehyde, USSR, Powders, Amides, Metal-plastic adhesives, Metal-glass adhesives, Metal-wood adhesives, *Resin adhesives.

Contents:
Basic trends of development in the plastics industry during 1959-1965, by M. I. Garbar
The new compact powder plastic FAK-4, by V. A. Zakharov, V. I. Zakharova, and G. N. Nadezhdina
New synthetic glues for the cementing of metals and non-metallic materials, by D. A. Kardashov, M. V. Sobolevskii, et al

AD-261 804 Div. 14
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ERASING DEVICE,
by Karl Furreg. 18 July 61, 5p. incl. illus.
(Trans no. MCL-1015 of Kais. Konigl. Patentamt - Osterreschesche - Patentschrift 72632, 4p. 25 Oct 1961)
Unclassified report

DESCRIPTORS: *Erasers, *Typewriters, Rubber, *Mechanical properties.

AD-261 893 Div. 14
(24 Aug 61) OTS price $1.60

Southern Research Inst., Birmingham, Ala.
THE DEVELOPMENT OF HEAT-RESISTANT PAINTS FOR METALS.
Bimonthly progress rept. no. 2, 1 Apr-31 May 61, by Everett L. Huffman and Arthur E. Raeuber, 15 June 61, 13p. incl. illus. tables (Rept. no. 4999-1264-II)
(Contract NOw 61-0546-d; Continuation of Contract NOa(s) 60-6075-c)
Unclassified report

DESCRIPTORS: *Heat resistant paints, *Phosphate coatings, *Ceramic coatings, Phosphites, Coatings, Oxides, Phosphates, Aluminum, Metals, Weatherproofing, Preparation, Aging, Mechanical properties, Humidity, Failure (Mechanics), Temperature, High temperature research, Magnesium compounds, Metallic compounds, Zinc compounds.

Coatings based on ZnO, dimethyl hydrogen phosphite, and ethyl acid phosphate were resistant to outdoor weathering for 6 months. The thickness of the coating, the amount of ethyl acid phosphate in the coating, and the relative humidity of the curing atmosphere affect the properties of the coating. The interactions among these variables are not yet fully understood, and still other variables not yet studied, may also be responsible for some differences in coating properties. Coatings made with MgO were resistant to a temperature of 1000 F, but the coatings were soft. Coatings made with hydrated Al_2O_3, Li_2TiO_3, Li_2Z+O_3 failed when heated to 1000 F; and mixtures of Bi_2O_3 or hydrated Al_2O_3 with H_3PO_4 did not cure to dry coatings. (Author)

AD-261 894 Div. 14
(24 Aug 61) OTS price $1.10

Southern Research Inst., Birmingham, Ala.
THE DEVELOPMENT OF HEAT-RESISTANT PAINTS FOR METALS.
Bimonthly progress rept. no. 1, 1 Feb-31 Mar 61, by Everett L. Huffman and A. E. Raeuber. 12 Apr 61, 9p. incl. illus. tables (Rept. no 4896-1264-I)
(Contract NOw 61-0546-d; Continuation of Contract NOa(s) 60-6075-c)
Unclassified report

DESCRIPTORS: *Heat resistant paints, *Phosphate coatings, Ceramic coatings, Phosphates, Phosphites, Coatings, Ceramic materials, Oxides, Aluminum, Metals, Weatherproofing, Temperature, High temperature research, Aging, Humidity, Failure (Mechanics), Zinc compounds.

The program objective is the development of coatings which can be applied to metal under

field conditions and will protect the metal during normal atmosphere exposure as well as during and after exposure to 1000 F. Al panels spray-coated with ZnO-dimethyl hydrogen phosphite-ethyl acid phosphate combinations were weathered for 4 months. Three of 17 coatings were only slightly affected; these 3 had been rated as well-bonded, adherent after water immersion and resistant to heating at 1000 F. Initial failure of the coatings appeared associated with crystal formation in the coating. The chief type of failure on weathering as well as on heating was flaking in a small area. Complete loss of coating over a large area also occurred. Coatings with the best properties were cured at 50% relative humidity.

AD-261 946 Div. 14, 27, 26
(28 Aug 61) OTS price $1.10

Aerojet-General Corp., Azusa, Calif.
DEVELOPMENT OF IMPROVED HIGH-STRENGTH PREIMPREGNATED MATERIALS FOR FILAMENT-WOUND ROCKET MOTOR CASES.
Informal progress rept. no. 1, 26 June-31 July 61.
15 Aug 61, 3p. (Rept. no. LO525-01-1)
(Contract NOw 61-0642-c)
Unclassified report

DESCRIPTORS: *Rocket cases, *Filament wound construction, Materials, *Glass textiles, Filaments, Resins, Impregnation, Processing, Manufacturing methods, Test methods, Mechanical properties, Specifications, Rocket motors, Laminates, Handling, Shipping, Tensile properties.

The handling and processing factors that affect the ultimate performance of glass filament and resins in highly stressed filament-wound motor cases are being studied. These studies will include the development of optimum procedures for the forming, processing, and handling of the glass filament, as well as documented, optimized, contolled, resin-impregnation techniques. The establishment of reliable test data and test methods with good correlation to actual performance with filament-wound motor cases will also be evaluated. The target requirement in this program will be to raise the ultimate tensile strength (glass stress) from 280,000 psi to a minimum of 375,000 psi and to maintain at least 75% of the original room-temperature strength at 300 F. (Author)

AD-261 978 Div. 14, 26
(29 Aug 61) OTS price $1.50

Carborundum Co., Latrobe, Pa.
DEVELOPMENT OF A CERAMIC ROLLER BEARING.
Rept. for Apr 58-Oct 60,
by K. M. Taylor and F. A. Saulino. Feb 61, 50p. incl. illus. tables.
(Contract AF 33(616)3074, Proj. 5(1315))
(WADD TR 60-684) Unclassified report

DESCRIPTORS: Bearings, *Ball bearings, *Roller bearings, Thrust bearings, *Ceramic aterials, *Cermets, Aluminum compounds, Oxides, Silicon compounds, Carbides, Titanium compounds, Physical properties, Friction, Erosion, Thermal stresses, Lubricants, Molybdenum compounds, Sulfides, Phthalocyanines, Test equipment, Design, High temperature research, Tests, Failure (Mechanics), Fracture (Mechanics), Oxidation, Molybdenum alloys, Titanium alloys, Lead compounds, Abrasion.

From the various ceramic and cermet materials available, hot-pressed Al2O3, hot-pressed SiC and K163B1 TiC cermet were selected for study on the basis of their desirable physical properties. Three types of wear and screening tests were carried out on these materials in combination with themselves and with each other (a total of 6 combinations). On the basis of the screening tests, 2 combinations, K163B1 cermet against itself and K163B1 cermet against hot-pressed Al2O3, were selected for full-scale bearing tests. Ten full-scale ball bearing tests were performed at 1000 F., using 2 bearing designs. Some of the tests were made without lubricants and some with metal-free phthalocyanine or MoS2. One full-scale test was made at 1500 F. with MoS2 in an inert atmosphere. While life of the non-lubricated bearings was short, some of the lubricated bearings operated successfully at the above temperatures for 8 to 28 hr under moderately severe conditions of speed and unit load. (Author)

AD-262 015 Div. 14, 26
(28 Aug 61) OTS price $3.60

Frankford Arsenal, Philadelphia, Pa.
THREADED FASTENERS LOCKING DEVICES EVALUATION OF LOCTITE SEALANT,
by S. M. Kalan. May 61, 34p. incl. illus. tables (Memo. rept. no. M61-29-1)
Unclassified report

DESCRIPTORS: *Seals, *Detents, Effectiveness, Tests, Shock resistance, Vibration.

AD-262 083 Div. 14, 12, 1, 30
(29 Aug 61) OTS price $3.00

Republic Aviation Corp., Farmingdale, N. Y.
INVESTIGATION OF HIGH EMITTANCE COATINGS TO EXTEND THE MACH NUMBER RANGE OF APPLICATION OF STRUCTURAL MATERIALS.
Rept. for July 58-Sep 60 on The Chemistry and Physics of Materials,
by Anthony Gravina and Milton Katz. Mar 61, 143p. incl. illus. tables.
(Contract AF 33(616)5925, Proj. 7360)
(WADD TR 60-102) Unclassified report

DESCRIPTORS: *Heat resistant paints, Coatings, Ceramic coatings, Metal coatings, Aluminum coatings, Paints, *Thermal radiation, Thermionic emission, Measurement, Radiometers, Airframes, Space probes, Satellite vehicles, Structures, Materials, Steel, Nickel alloys, Titanium alloys, Energy, Radiation damage, Metallic compounds, Oxides, *Test facilities, Test equipment, Design, Tests, Electromagnetic waves, Refractory coatings, High temperature research.

The report describes the design and assembly of an apparatus capable of measuring the total and spectral normal emittance of solids at temperatures from 400 to 1800 F, and pressures from atmospheric to less than 5 microns Hg. Ceramic, paint, oxide and metallic coatings applied to Inconel X, A-286 steel, and 6 Al-4V titanium were investigated. Emittance data are presented for materials tested after short term, prolonged, and cyclic temperature exposures in the noted temperature and pressure range of the instrument. The effect of contamination is also considered for some materials. It is shown that the emittance of metal substrates can be appreciably altered by the application of suitable coatings. (Author)

Division 14 - MATERIALS (NON-METALLIC)

AD-262 125 Div. 14, 13, 3
(13 Sep 61) OTS price $1.60

Institute of Paper Chemistry, Appleton, Wis.
DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL.
Monthly progress rept. no. 10, 29 June-28 July 61,
by L. E. Leporte and T. A. Howells. 25 Aug 61, 15p. incl. illus. tables.
(Contracts DA 18-108-405-cml-941 and DA 18-108-cml-6561)

Unclassified report

DESCRIPTORS: *Fiberboard, Shelters, Chemical warfare agents, Aerosols, Diffusion, Penetration, Poisonous gases, Cyanogen chloride, Wood pulp, Additives, Charcoal, Production, Preparation, Physical properties, Countermeasures, Absorption.

The use of the term, critical bed, as a means of evaluating the activity of the charcoal present in diffusion board by comparison is introduced. The critical bed concept is a parameter relationship dependent primarily on the activity of the charcoal. It is an extrapolation at a constant slope to zero minutes gas life in a plot of gas life versus charcoal loading and it seems to be relatively unaffected by variations such as caliper and charcoal loading which make the comparison of boards according to raw gas life data difficult. Recent tests showed that the activity of most of the sized and unsized diffusion board made in the laboratory and in the pilot run deteriorated after a short period of storage in ambient room conditions. The critical beds of some samples of pilot run board increased as much as 20% (board sized with Aquapel 360 and Kymene 557 and board sized with Cyron) in about 1 1/2 mo; this is equivalent to a loss of 26 min gas life protection at a 5 g/100 sq cm charcoal loading. The critical bed of the unsized pilot run board increased 8.3%. Samples of the pilot run board, planed on both sides and aged, showed 19 to 47% increases in critical bed loading over the critical bed of comparatively aged unplaned sample. (Author)

AD-262 165 Div. 14, 7, 8
(31 Aug 61) OTS price $2.60

Battelle Memorial Inst., Columbus, Ohio.
THERMAL-SHOCK RESISTANT PROPERTIES OF CERAMICS.
Final rept. on Task 606,
by Earl J. Mills. 30 Apr 61, 18p. incl. illus. table.
(Contract DA 36-039-sc-85294)

Unclassified report

DESCRIPTORS: *Ceramic materials, Thermal stresses, Measurement, Insulating materials, *Electric insulation, Test methods, Test facilities, Physical properties, Mechanical properties, Elasticity, Thermal expansion, Thermal conductivity, Heat transfer, Thermal diffusion, Thermal radiation, Stresses, Analysis, Heating, Cooling, Water, Air, Liquid metals, Salts, Electrical equipment, Electronic equipment.

An investigation was made to develop a test method and establish criteria for thermal-stress resistance to provide means of assuring adequate performance in this respect of the ceramic components procured by the Signal Corps. Emphasis was placed on developing a single general test for materials listed under Specification MIL-I-10. A thorough analysis was made of the thermal-stress conditions encountered in service. Next, a review of existing methods for determining thermal-stress resistance of ceramics was conducted and the methods were evaluated. One method was selected which appeared to give the most reproducible results, and this method was used to evaluate some materials listed in Specification MIL-I-10. The most common failures appeared to be of the one-cycle type rather than of the fatigue type. The most severe thermal loading envisioned was a localized hot spot on the surface of a large ceramic body. This type of loading is sometimes experienced during an emergency repair condition in the field. (Author)

AD-262 238 Div. 14, 26, 27
(31 Aug 61) OTS price $6.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATION OF HIGH TEMPERATURE RESISTANT MATERIALS.
Quarterly rept. no. 21, 1 May-31 July 61,
by N. E. Poulos, S. R. Elkins, and J. D. Walton. 31 July 61, 65p. incl. illus. tables.
(Contract NOrd-15701)

Unclassified report

DESCRIPTORS: *Refractory materials, *Ceramic materials, Cermets, Silicon compounds, Silicates, Oxides, Aluminum compounds, Chlorides, *Ceramic coatings, *Flame spraying, Impregnation, Processing, *Refractory coatings, Thermal insulation, Spray nozzles, Manufacturing methods, Radomes, Plastics, Erosion, Silicon coatings.

X-ray diffraction studies showed that for slip-cast fused silica impregnated with AlCl3 the percentage bulk of cristobalite was reduced from 73.3% to 4.2% after 3 cycles following revised firing and impregnation procedures. Fused silica substrates could not be coated with alumina using conventional arc-spraying techniques. Procedures for arc-plasma flame glazing on fused silica are reported; average transverse strength over unglazed samples was increased 34%. Water absorption determinations indicated that the slip-cast fused silica surfaces can be sealed by arc-plasma glazing. F-40 Arc Plasma Unit alumina particle melting studies demonstrated that more complete particle melting took place when the high enthalpy-low velocity nozzle was used instead of the conventional No. 3 spray nozzle. Particles sprayed with the latter exploded on contact with water. Other studies included work on thermal shock, radome fabrication, and NOL sample evaluation in oxyhydrogen rocket motor exhaust.

AD-262 242 Div. 14
(1 Sep 61) OTS price $1.60

Frick Chemical Lab., Princeton U., N. J.
A RAPID MOLECULAR WEIGHT DETERMINATION FOR LINEAR POLYETHYLENE,
by A. V. Tobolsky, A. Eisenberg, and D. Katz. 12 July 61, 11p. incl. table (Technical rept. no. RLT-34)
(Contract Nonr-185807)

Unclassified report

DESCRIPTORS: Polymers, *Ethylenes, *Molecular weight, Measurement, Tests, Test methods, Physical properties, Viscosity, Tensile strength, Shear stresses, Determination, Elasticity.

The molecular weight of polymers of over 100,000 can be determined by using the 10 second Gehman modulus at 150 C. This method is not absolute but is both rapid and convenient. Experiments were conducted on linear polyethylene. (Author)

AD-262 245 Div. 14
(1 Sep 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
RELATIVE AERATION REQUIREMENTS BY SOFT ROT AND BASIDIOMYCETE WOOD-DESTROYING FUNGI,
by Catherine G. Duncan. May 61, 6p. illus. tables (Rept. no. 2218)
Unclassified report

DESCRIPTORS: *Wood, Deterioration, Fungi, *Fungus deterioration, Air, Growth, Culture, Culture media, Measurement.

Isolates of 50 soft-rot fungi and 41 Basidiomycete decay fungi were studied for growth responses in sealed and partially closed culture tubes. All isolates maintained a uniform rate of linear growth until oxygen was exhausted in the tubes, which suggests that respiration was mediated through the cytochrome system. Linear growth was suppressed more by lack of aeration with the soft rotters than with the Basidiomycetes, but the reserve was true as regards many soft rotters isolated from cooling towers, when growth was measured by the weight of mycelium produced. Taking total growth (weight of mycelium) as the preferable index of relative tolerance of restricted aeration, it is concluded that the prevalence of soft rot in the wet wood of cooling towers, and the near absence of Basidiomycetes, is attributable at least in part to a superior tolerance of poor aeration on the part of the soft-rot fungi concerned. No significant difference in growth responses was noted between white rotters and brown rotters in the Basidiomycete group. (Author)

AD-262 246 Div. 14
(1 Sep 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
EFFECT OF DEFECT PLACEMENT AND TAPER SETOUT ON LUMBER GRADE YIELDS WHEN SAWING HARDWOOD LOGS,
by F. B. Malcolm. May 61, 8p. tables (Rept. no. 2221)
Unclassified report

DESCRIPTORS: *Wood, Test methods, Processing, Quality control, Sawmills, Cutting tools.

The study here reported was made to evaluate some of the principles used by skilled sawyers as well as some of the principles developed at the Forest Products Laboratory for getting the optimum grade from all logs. The study, which was statistically designed, evaluates six sawing methods for which the sawing faces were positioned relative to gross external defects and the amount of setout for log taper. Lumber-grade yield tallies were summarized, and a quality index was computed for individual logs, each grade, and each method. This index was calculated from the value of the lumber sawn, based on prevailing market quotations. It was concluded from the study that sawmill operators lose considerable money in producing their lumber by ignoring the position of defects on sawing faces and taper setout. (Author)

AD-262 247 Div. 14
(1 Sep 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
COPPER TOLERANCE OF SOME WOOD-ROTTING FUNGI,
by George Y. Young. June 61, 7p. illus. table. (Rept. no. 2223)
Unclassified report

DESCRIPTORS: Copper, Fungi, Fungus deterioration, *Wood, Copper compounds, Deterioration, Fungusproofing.

The generally high tolerance of acid-forming brown-rot fungi and the low tolerance of white-rot fungi to copper sulfate was confirmed for 16 species, including Poria cocos Wolf., a fungus associated with the failure of copper-napthenate treated fence posts in Florida, and four other brown-rot species not previously reported as copper tolerant. The tolerance of the brown-rot species was strikingly increased by lowering the pH of the substratum from pH 6 to pH 2 with sulfuric acid. Several mechanisms for fungus tolerance to copper have been suggested; all require a decrease in the pH of the medium. (Author)

AD-262 248 Div. 14, 26, 4
(1 Sep 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
WOOD. A SOURCE OF RAW MATERIAL FOR CHEMICAL UTILIZATION,
by Edward G. Locke. June 61, 6p. tables (Rept. no. 2224)
(In cooperation with Wisconsin U., Madison)
Unclassified report

DESCRIPTORS: *Wood, Forestry, Industrial production, Wood pulp, Plywood, Turpentine, Sources, Paper, Lignin, Cellulose, *Chemical industry.

More than 80 million tons of low-value wood could be made available annually as raw material for conversion to organic chemicals. This material would be available primarily as processing residues and harvesting residues. Data (orignially collected in 1952) are given for quantities and types of residues available by region in the United States. (Author)

AD-262 279 Div. 14, 8
(24 Aug 61) OTS price $1.60

ITT Federal Labs., Nutley, N. J.
DEVELOPMENT OF MANUFACTURING PROCESSES FOR HIGH PURITY ELECTRONIC CERAMICS.
Interim technical progress rept. 6 Feb-5 May 61, by J. H. Battle, E. W. Currier and others. May 61, 17p.
(Contract AF 33(600)42473)
(ASD TR 7-772, vol. 1) Unclassified report

DESCRIPTORS: *Ceramic materials, *Ferroelectric materials, *Piezoelectric materials, Titanates, Barium compounds, Strontium, Production, Chemical impurities, Materials, Preparation, Niobates, Tantalum compounds, Zirconates, Manufacturing methods, Chemical reactions, Spectrographic analysis, Volumetric analysis, Colorimetric analysis, Gravimetric analysis, Physical properties, Hydrolysis, Electronic equipment, Particles, Measurement.

The purpose of this project is to develop new or improved manufacturing methods for large scale production of ferroelectric and piezoelectric ceramic materials such as the titanates, zirconates, niobates and tantalates. A major requirement is high purity (99.95%). A process for producing barium titanate by direct chemical precipitation from a barium hydroxide solution at high pH through the addition of tetraisopropyl titanate was carried through a series of range-finding runs. Preliminary results indicate that material meeting the desired purity level may readily be produced. Uniformity, reproducibility and scale-up studies of the material as well as fabricating devices from the material are currently under study. (Author)

15. MATHEMATICS

AD-261 657 Div. 15
(22 Aug 61) OTS price $2.60

Cornell U., Ithaca, N. Y.
A RANDOM INTERVAL FILLING PROBLEM,
by P. E. Ney. 3 Aug 61, 25p. (Technical rept. no. 4)
(Contract Nonr-40103; In cooperation with Institute for the Study of Human Variation, Columbia U., New York, Contract Nonr-26633, Proj. NR 042-034)
Unclassified report

DESCRIPTORS: *Statistical distributions, Integrals, *Probability, Integral transforms.

AD-261 658 Div. 15, 33
(22 Aug 61) OTS price $7.60

California U., Los Angeles.
AN ENGINEERING ANALYSIS OF CARGO HANDLING-XI. A DETERMINISTIC MATHEMATICAL MODEL FOR A TWO-LINK, ONE-NODE SYSTEM,
by Neal A. Richardson. June 61, 71p. incl. illus. (Rept. no. 61-35)
(Contract Nonr-23307)
Unclassified report

DESCRIPTORS: *Cargo, *Handling, Mathematical analysis, Mathematical prediction, Measurement, Transportation, Production, Human engineering, *Applied mathematics.

The greater part of this report concerns the steady-state productivity of a simple system consisting of two serial-handling operations. General relationships are developed from which one can predict the productivity of such a system from basic characteristics of the two carriers operating independent of system induced delay. These general relationships are developed for two cases. In the first case, the operator bases his actions entirely upon the present state of the system. In the second case, the operator, after some experience in the system, acts in anticipation of changes produced in the system by the other carrier. (Author)

AD-261 659 Div. 15
(22 Aug 61) OTS price $4.60

California U., Berkeley.
ON THE TRANSITIVITY OF HOLONOMY SYSTEMS,
by James Simons. July 61, 42p. (Technical rept. no. 22)
(Contract AF 49(638)79)
(AFOSR-1006)
Unclassified report

DESCRIPTORS: *Algebraic topology, Algebras, Transformations (Mathematics), *Groups (Mathematics), Geodesics, Tensor analysis, Integral equations, Operators (Mathematics).

A classificatio of possible candidates for the holonomy groups of manifolds having affine connections with zero torsion discloses only groups transitive on the unit sphere in the tangent space of the manifold, except in the case where the manifold is a symmetric space of rank greater than or equal to 2. An intrinsic proof of this rather startling fact, and an algebraic generalization of the notion of a holonomy group are given with a short, intrinsic proof of the result on transitivity. Although only that portion of the problem which has to do with Riemannian manifolds is treated, it is possible that the devices employed could be altered to pertain to other situations. (Author)

AD-261 703 Div. 15
(22 Aug 61) OTS price $2.60

Naval Weapons Lab., Dahlgren, Va.
THE NUMERICAL SOLUTION OF LINEAR ORDINARY DIFFERENTIAL EQUATIONS,
by Charles H. Frick. 10 July 61, 31p. incl. tables (NWL rept no. 1760)
Unclassified report

DESCRIPTORS: *Differential equations, *Integration, Polynomials, *Numerical analysis, Functions, Trigonometry, Particle trajectories.

Obrechkoff integration formulas are used in the numerical solution of linear ordinary differential equations. Applications to the exponential function, circular and hyperbolic sines and cosines, and particle ballistics are made. (Author)

AD-261 852 Div. 15, 30
(24 Aug 61) OTS price $1.60

Chicago U., Ill.
THE ALGEBRAIC MECHANISM OF FIBER SPACES.
Final rept. 1 Oct 55-31 May 61,
by Saunders Mac Lane. June 61, 13p.
(Contract AF 18(600)1383, Proj. 9769C)
(AFOSR-1005)
Unclassified report

DESCRIPTORS: *Research program administration, *Mathematics, *Algebraic topology, Groups (Mathematics), Topology, Functional analysis, Algebra, Algebras, *Bibliography.

The contract, entitled, The Algebraic Mechanism of Fiber Spaces entered into a variety of topics in algebra and in topology related to its main objectives. This analysis will summarize the various investigations concerned, classified by subject matter. The summary includes the following items: J. F. Adams on Hopf Invariant one, John Thompson on the Frobenius problem, group theory, algebraic topology: Summer 1957; Subsequent Research Associates, twisted simplicial products, research assistants in topology, homological algebra, research associates in Homological algebra, research assistants in Homological algebra, lie groups, a categorical theory of algebras (S. Mac Lane), and on cohomotopy multiplication in functional spaces (A. Granas). (Author)

AD-261 853 Div. 15
(24 Aug 61) OTS price $5.60

Chicago U., Ill.
ON A CLASS OF DOUBLY TRANSITIVE GROUPS.
Technical note,
by Michio Suzuki. June 61, 53p. 12 refs.
(Contract AF 49(638)858, Proj. 9752)
(AFOSR-1013)
Unclassified report

DESCRIPTORS: *Groups (Mathematics), Series, Combinatorial analysis, Functions.

This study considers a class of doubly transitive groups satisfying the condition that the identity is the only element leaving three distinct

letters fixed. The main object of the investigation is to classify the groups which do not contain a regular normal subgroup of order 1 + N in case N is even. (Author)

AD-261 888 Div. 15
(24 Aug 61) OTS price $7.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON TESTS WITH LIKELIHOOD RATIO CRITERIA IN SOME PROBLEMS OF MULTIVARIATE ANALYSIS,
by Narayan Chandra Giri, 30 July 61, 76p. incl. illus. (Technical rept. no. 39)
(Contract Nonr-22521, Proj. NR-042-993)
Unclassified report

DESCRIPTORS: *Statistical analysis, *Statistical tests, Vector analysis, Matrix algebra, Measure theory, Distribution theory, Probability, Transformations (Mathematics).

AD-261 895 Div. 15
(24 Aug 61) OTS price $4.60

Applied Mathematics and Statistics Labs., Stanford, U., Calif.
THE SELECTION OF AN OPTIMUM SAMPLING PARTITION,
by Arnold F. Goodman. 3 Aug 61, 46p. incl. illus. 13 refs. (Technical rept. no. 72)
(Contract Nonr-22552, Proj. NR-342-022)
Unclassified report

DESCRIPTORS: *Sampling, Probability, Measure theory, Distribution theory, Statistical distributions, Statistical tests, Functions, *Sequential analysis.

The statistical problem concerned with the selection of an optimum sampling partition to use with a specified statistical test is analyzed. The statistical test used is a Wald sequential probability ratio test. An asymptotic property of this test suggests a measure for the quality of a sampling partition upon which a definition of an optimum one is based. (Author)

AD-261 904 Div. 15
(24 Aug 61) OTS price $1.10

Trinity Coll., Hartford, Conn.
CONTRIBUTIONS TO THE THEORY OF SERIES OF CHARACTERISTIC FUNCTIONS OF THE DIFFERENTIAL OPERATOR $z^N - d^2/dz^2$,
by W. J. Kilmczak. 31 Dec 58, 6p.
(Contract AF 18(600)1397)
(AFOSR TR 59-2) Unclassified report

DESCRIPTORS: *Differential equations, *Operators (Mathematics), Series, Functions, Sequences, Integral equations, Bessel functions.

Research is summarized on certain aspects of the theory of series of the form $f(z) = \sum_{n=0}^{\infty} f_n w_n(z)$, where x is a complex variable and the $w_n(z)$ are characteristic functions of the differential operator $\delta_z = z^N - d^2/dz^2$, N being a positive integer. (Author)

AD-261 914 Div. 15
(28 Aug 61) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
MAHLER MATRICES AND THE EQUATION QA = AQm,
by J. L. Brenner. June 61, 26p. (MRC Technical summary rept. no. 238)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Matrix algebra, Groups (Mathematics), Vector analysis, Equations, Transformations (Mathematics), Algebra.

Several sets of matrices are defined; each set forms an abelian group. The elements of the matrices are 0, 1, -1 and other roots of unity (or sums of roots of unity). The determinant, characteristic roots, vectors, and elementary divisors are also found. Thus the matrices form a convenient set of test matrices for a routine which purports to solve a matrix. A typical test matrix may involve nonreal elements; if each element of the matrix is replaced by a 2 by 2 matrix in the usual way the roots of the expanded real matrix are the roots of the test matrix and their conjugates. The vectors of the expanded matrix are easily found also. (Author)

AD-261 915 Div. 15
(28 Aug 61) OTS price $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE EXISTENCE OF INVARIANT MEASURES,
by H. M. Schaerf. June 61, 4p. (MRC Technical summary rept. no. 236)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Measure theory, *Groups (Mathematics), Transformations (Mathematics), Functional analysis, Integrals, Functions.

AD-261 919 Div. 15
(25 Aug 61) OTS price $1.60

Minnesota U., Minneapolis.
ON THE REGULARITY OF GAUSSIAN PROCESS SAMPLE FUNCTIONS,
by Monroe D. Donsker. 1 Jan 58, 11p. (Technical note no. 7)
(Contract AF 18(603)30)
(AFOSR TN 58-1060) Unclassified report

DESCRIPTORS: *Statistical processes, *Statistical functions, Integral equations, Inequalities, Determinants, Sequences.

Let (x sub t, 0 greater than or equat to t less than or equal to 1) be a Gaussian process with mean function zero and covariance function continuous in both its variables. Certain connections between the regularity of the sample-functions x sub t and the asymptotic properties of related Fredholm determinants is discussed. (Author)

AD-261 927 Div. 15, 4
(28 Aug 61) OTS price $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
ON A DIALYSIS PROBLEM,
by J. H. B. Kemperman. June 61, 6p. (MRC Technical summary rept. no. 235)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Probability, Matrix algebra, *Sequential analysis, *Statistical distributions, Statistical analysis, Integral equations, Polynomials, Molecules, Particles, Separation.

A molecular compound (Biometrika 47:69-77, 1960) is considered involving c-1 dialysis sacs $S_1,\ldots,S_{c-1}$ each suspended in a separate bath and a container S_c. It is assumed that a molecule which at time n - 1 (n = 1,2,...) is inside S_i (i = 1,...,c - 1) will through dialysis be outside S_i at time n with a probability 1 - p, (p fixed, $0 < p < 1$). At the end of the time interval (n - 1,n) one transfers the fluid on the inside of S_i (i = 2,...,c - 1) to the inside of S_{i-1} and the fluid on the outside of S_i (i = 1,...,c - 1) to the inside of S_{i+1}; the fluid already in S_1 or S_c remains there. The conditional probability $q_{ij}(n)$ is computed that a particle which at time 0 is inside S_i will at time n (after the n-th transfer has been performed) be inside S_j. (Author)

AD-261 929 Div. 15
(28 Aug 61) OTS price $4.60

Mathematics Research Center, U. of Wisconsin, Madison.
A UNIFIED THEORY FOR ESTIMATION AND ITERATION IN METRIC SPACES AND PARTIALLY ORDERED SPACES,
by J. Schroder. July 61, 46p. 19 refs. (MRC Technical summary rept. no. 237)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Functional analysis, *Sequences, Operators (Mathematics), Equations, Inequalities, Errors, Functions, Matrix algebra.

AD-261 931 Div. 15
(28 Aug 61) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
CIRCULANT MATRICES AND SOME GENERALIZATIONS,
by J. L. Brenner. June 61, 14p. (MRC Technical summary rept. no. 239)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Matrix algebra, Complex numbers, *Combinatorial analysis, Number theory, Vector analysis.

AD-261 949 Div. 15
(28 Aug 61) OTS price $3.60

Parke Mathematical Labs., Inc., Carlisle, Mass.
A NEW APPROACH TO THE STUDY OF BINARY SYSTEMATIC CODES,
by Lorenzo Calabi. Dec 60, 31p. (Scientific rept. no. 6)
(Contract AF 19(604)3471)
(AFCRL-6) Unclassified report

DESCRIPTORS: Sequences, *Information theory, Errors, Coding, Groups (Mathematics), Matrix algebra, Algebra, Combinatorial analysis.

A set theoretical model is introduced to formulate the theory of binary systematic codes for the correction of errors and blanks. Use is also made of the theory of matroids. (Author)

AD-261 985 Div. 15, 25
(25 Aug 61) OTS price $4.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
FUNCTION THEORETIC SOLUTIONS OF CERTAIN BOUNDARY-VALUE PROBLEMS,
by V. P. Sreedharan. July 61, 42p. 16 refs. (Technical rept. no. 34)
(Contract AF 49(638)227)
(AFOSR-1083) Unclassified report

DESCRIPTORS: *Partial differential equations, *Integral equations, Integrals, Green's function, Special functions, Operators (Mathematics), Functions, Integration, Inequalities, Bessel functions, Wedges, Diffraction, Sound.

The domains of analyticity of solutions of the equation delta u ± k square times u equals 0 in two independent variables are studied with a view to solving boundary-value problems in the large. The boundary value problems are transformed into function theoretic problems. Specifically the Sommerfeld half-plane problem for delta u ± K square times u equals 0 is solved. A related result on integral equations is obtained. Green's functions for a wedge with various boundary conditions are constructed in the case of the equation delta u ± k square times u equals 0. (Author)

AD-262 025 Div. 15
(29 Aug 61) OTS price $6.60

Liege U. (Belgium).
THE CAUCHY PROBLEM FOR PARTIAL DIFFERENTIAL EQUATIONS OF THE SECOND ORDER AND THE METHOD OF ASCENT,
by F. J. Bureau. May 61, 56p. (Technical scientific note no. 6)
(Contract AF 61(052)86)
(AFOSR-756) Unclassified report

DESCRIPTORS: *Partial differential equations, Integral equations, Functional analysis, Differential equations, Polynomials, Series, Theory.

A method of ascent is used to solve the Cauchy problem for linear partial differential equations of the second order in p space variables with constant coefficients i.e., the pure wave equation, the damped wave equation, and the heat equation. This method consists of inferring the solution of the problem referred to from the well known solution of the same problem for one space variable. The commutability of repeated pf integral, the solution deduced by the method of singularities for the Cauchy problem for the damped wave equation, and the solution of singular integral equations of the Volterra type are also considered. (Author)

AD-262 032 Div. 15
(29 Aug 61) OTS price $4.60

Hebrew U. (Israel).
OCCUPATION TIMES FOR MARKOV AND SEMI MARKOV CHAINS,
by Harry Kesten. Mar 61, 45p. 16 refs. (Technical (Scientific) note no. 16)
(Contract AF 61(052)187)
(AFOSR-980) Unclassified report

DESCRIPTORS: *Probability, *Distribution theory, *Statistical processes, Sequences, Functions, Statistical functions, Integrals, Integral equations.

Limiting distributions for occupation times of states in (semi) markov chains are obtained. (Author)

AD-262 034 Div. 15
(29 Aug 61) OTS price $1.10

Hebrew U. (Israel).
MARKOV PROCESSES WITH STATIONARY MEASURE,
by S. R. Foguel. Apr 61, 8p. (Technical scientific note no. 17)
(Contract AF 61(052)187)
(AFOSR-1199) Unclassified report

DESCRIPTORS: *Statistical processes, *Measure theory, Probability, Sequences, Functions, Algebra.

The analysis deals with Markov processes with stationary measure that is not finite. Various results on processes with finite stationary measure are generalized and few added. (Author)

AD-262 036 Div. 15
(30 Aug 61) OTS price $2.60

Israel Inst. of Applied Social Research.
INEQUALITIES FOR SIGN FREQUENCIES OF LATENT ROOTS,
by Louis Guttman. May 61, 19p. (Technical note no. 7)
(Contract AF 61(052)121; In cooperation with Hebrew U. (Israel))
(AFOSR-886) Unclassified report

DESCRIPTORS: *Inequalities, *Matrix algebra, Polynomials, Series.

Contents:
Notation
Inequalities for Gramian matrices
Inequalities for Hermitian matrices
Inequaltiies for the sum of Hermitian matrices
Inequalities for products
The general case

AD-262 075 Div. 15
(29 Aug 61) OTS price $2.60

Parke Mathematical Labs., Inc., Carlisle, Mass.
A SOLUTION OF THE MINIMIZATION PROBLEM FOR BOOLEAN FORMULAS,
by L. Calabi. Dec 60, 21p. incl. tables (Scientific rept. no. 7)
(Contract AF 19(604)3471)
(AFCRL-14) Unclassified report

DESCRIPTORS: *Algebra, *Special functions, Combinatorial analysis, Operators (Mathematics), Functions, Sequences, Algebras.

This report investigates the derivation of an algorithm for the construction of the set of all the most economical boolean formulas in eta or less letters. The cost of a formula is defined in very general terms. (Author)

AD-262 080 Div. 15
(29 Aug 61) OTS price $3.60

RIAS, Inc., Baltimore, Md.
LOCALLY ONE-TO-ONE MAPPINGS AND A CLASSICAL THEOREM ON SCHLICHT FUNCTIONS,
by G. H. Meisters and C. Olech. 1961, 29p. incl. illus. 11 refs. (Technical rept. no. 61-4)
(Contracts AF 49(638)382 and DA 36-034-ORD-3220)
(AFOSR-1086) Unclassified report

DESCRIPTORS: *Topology, *Complex variables, Functions, Transformations (Mathematics), Determinants.

Some topological theorems are given which are similar to Darboux's Theorem and from one of which (Theorem 1) Darboux's Theorem is easily deduced. Our theorems are like Darboux's Theorem in the sense that we assume a certain mapping to be one-to-one on the boundary of its domain and conclude that it is one-to-one everywhere on its domain. (Author)

AD-262 082 Div. 15
(25 Aug 61) OTS price $2.60

Rensselaer Polytechnic Inst., Troy, N. Y.
A METHOD OF SOLUTION FOR QUADRATIC PROGRAMS,
by C. E. Lemke. 1 July 61, 24p. (RPI MathRep no. 46)
(Contract Nonr-59113)
Unclassified report

DESCRIPTORS: *Scheduling, Numerical analysis, Matrix algebra, Transformations (Mathematics).

A method is described for minimizing a strictly convex quadratic functional of several variables constrained by a system of linear inequalities. The method takes advantage of strict convexity by first computing the absolute minimum of the functional. In the event that the values of the variables yielding the absolute minimum do not satisfy the constraints, an equivalent and simplified quadratic problem in the Lagrange multipliers is derived. An efficient algorithm is devised for the transformed problem, which leads to the solution in a finite number of applications. A numerical example illustrates the method. (Author)

AD-262 159 Div. 15
(30 Aug 61) OTS price $3.60

Wayne State U., Detroit, Mich.
FIBERINGS OF ENVELOPING SPACES, II,
by Sze-Tsen Hu. Aug 61, 31p. (Technical note no. 12)
(Contract AF 49(638)179)
(AFOSR-1048) Unclassified report

DESCRIPTORS: *Algebraic topology, Topology, Sequences.

The objective is the study of the terminal projection from the m-th enveloping space E sub m(X) into the m-th residual space R sub m(X). It turns out that it is a fibering without assuming the local conditions on X. (Author)

AD-262 260 Div. 15, 33
(1 Sep 61) OTS price $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
STATISTICAL PROPERTIES OF LOW-DENSITY TRAFFIC,
by George Weiss and Robert Herman. July 61, 18p. incl. illus. 14 refs. (Technical note no. BN 254)
(Contract AF 18(600)1315)
(AFOSR-1080) Unclassified report

DESCRIPTORS: *Traffic, Mathematical analysis, Statistical analysis, *Distribution theory, Statistical distributions, Density, Velocity, Integrals, Integral equations, *Probability, Vehicles.

An infinitely long line of traffic moving on a highway without traffic lights or other inhomo-

genecities is studied. It is assumed that each car travels at a constant speed which is a random variable. A further assumption is that when one car overtakes another, passing is always possible and occurs without change of speed. It is shown that any initial headway distribution must relax to a negative exponential distribution in the limit of t becoming infinite. The statistics of passing events are examined, and it is shown that the probability of passing or being passed by n cars in time t is described by a Poisson distribution. (Author)

16. MEDICAL SCIENCES

AD-261 551 Div. 16
(21 Aug 61) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EFFECT OF SMALL DOSES OF QUININE ON THE TEMPORARY THRESHOLD SHIFT OF HEARING INDUCED BY HIGH-ENERGY NOISE EXPOSURE,
by Granville J. Womack. May 61, 10p. incl. illus. tables, 18 refs. (Rept. no. 61-70)
Unclassified report

DESCRIPTORS: *Auditory thresholds, *Auditory acuity, *Noise, *Alkaloids, Sulfates, *Hearing, Dosage, Experimental data, Physiology.

The temporary threshold shift of hearing at 4000 cps after marginally hazardous white noise exposure was examined in 14 male subjects of normal hearing. Seven subjects took quinine sulfate, 300 mg. daily for 3 days, and 7 took a placebo for 3 days. There was no significant difference in threshold shift between the experimental group and control group at 2 minutes, 6 minutes, and 24 hours after noise exposure. (Author)

AD-261 552 Div. 16, 4
(21 Aug 61) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
THE EFFECT OF VARYING PROTEIN CONCENTRATION ON THE INTERACTION OF PROTEINS AND BIS(2-GUANIDOETHYL) DISULFIDE,
by Bernard Shapiro. July 61, 6p. incl. illus. (Rept. no. 61-65)
(In cooperation with Albert Einstein Medical Center, Philadelphia, Pa.).
Unclassified report

DESCRIPTORS: *Proteins, *Solutions, Buffers, Sulfides, Guanidines, Ethyl radicals, Chemical reactions, Cobalt, Radioactive isotopes, Radiation effects, Oxidation, Biochemistry.

Buffered solutions containing 0.0005 molar GED-S35 and various concentrations of ten proteins were prepared and aliquots of each solution were irradiated by means of a Co60 gamma-ray source. The radiation products were separated by paper chromatography, scanned with a GM counter, and quantitatively measured by planimetry of the areas under the recorded radioactive peaks. Protein-binding of the protective agent was noted in the unirradiated solutions and appeared to increase with an increase in protein concentration. Protamine, gelatin, insulin, and gamma globulin bound very little of the protective agent. Radiation increased the amount of protein-binding in almost all the protein solutions. Urease showed the least radiation-induced oxidation of GED-S35 was evidenced in 0.1% and 0.2% protein solutions by an increased amount of GED-S35 remaining in solution and a decreased percent of 2-guanidoethanesulfinic acid, taurocyamine, and sulfate appearing in the solution after irradiation. These results indicate that although interaction of GED with radicals is negligible in solutions containing large amounts of protein, radical catching by GED may still be significant in solutions where the protein concentration is low. (Author)

AD-261 554 Div. 16
(21 Aug 61) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
COMPARISON OF GLYCOGENESIS AND GLYCONEOGENESIS IN ALTITUDE-EXPOSED AND NORMAL MICE,
by Anne E. Hudock and L. Joe Berry. June 61, 8p. incl. tables, 16 refs. (Rept. no. 61-44)
(In cooperation with Bryn Mawr Coll., Pa.)
Unclassified report

DESCRIPTORS: High altitude, *Physiology, *Laboratory animals, *Glycogen, Simulation, *Metabolism, Biosynthesis, *Blood sugar, Determination, Tissues (Biology), Adrenal glands, Excision, Experimental data.

A comparison is made in the glycogen levels of normal mice, of mice continuously exposed to a simulated altitude of 20,000 feet for 3 to 6 weeks with and without daily injection of 1 mg. of cortisone, and of adrenalectomized mice. When glucose, sodium pyruvate, or monosodium glutamate is injected into normal mice and into altitude-exposed mice not given the hormone, acclimatized animals have significantly less glycogen in tissues than do normal mice. Adrenalectomized mice, compared to altitude-exposed mice, have significantly higher glycogen values under fed and fasted conditions and following glucose injections, except that liver glycogen in fed, adrenalectomized mice is significantly lower than that in acclimatized animals. Cortisone-treated, altitude-exposed mice also have higher glycogen values than acclimatized control mice have. Absorption of glucose from the peritoneal cavity is slower than from the digestive tract, in both normal and altitude-exposed mice. The latter animals absorb glucose from the peritoneum more slowly than do normal mice. Cortisone-treated, altitude-exposed animals have a higher rate of glucose absorption from the peritoneal cavity than do either normal or acclimatized animals not given hormone. (Author)

AD-261 555 Div. 16
(21 Aug 61) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
ABERRANT ADRENAL CORTICAL TISSUE NEAR THE TESTIS IN HUMAN INFANTS,
by Elmer V. Dahl. Mar 61, 10p. incl. illus. table, 42 refs. (Rept. no. 61-61)
Unclassified report

DESCRIPTORS: *Testes, Man, *Tissues (Biology), *Adrenal glands, Histological sections, Identification, Infants, *Cells (Biology).

Heterotopic nodules of adrenal cortex were found in structures immediately adjacent to the testis in 11 of 100 infants examined at necropsy. In each case, the histologic appearance of the heterotopic adrenal tissue was closely similar to that of the adrenal glands proper. Degeneration of the provisional cortex in the aberrant nodules and in the adrenal glands was similar, and the nodules relfected also special morphologic changes which were apparent in the adrenal glands. These structural similarities suggest that the aberrant adrenal tissue responds to both normal and abnormal stimuli which affect the adrenal glands. (Author)

AD-261 556 Div. 16
(21 Aug 61) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EVALUATION OF THE POSTMORTEM TEST FOR HYPOXIA IN THE HUMAN,
by Donald D. Van Fossan, Elwood E. Baird and others. May 61, 12p. incl. illus. tables, 32 refs. (Rept. no. 61-55)
(In cooperation with Texas U., Medical Branch, Galveston)
Unclassified report

DESCRIPTORS: *Anoxia, *Lactic acid, *Brain, Determination, Tissues (Biology), Production, Tests, Man, Physiology, Biochemistry.

In previous investigations, a simple postmortem test for determining ante-mortem hypoxia was developed and successfully proved on animals. The test is based on the fact that lactic acid accumulates in brain tissue of animals made hypoxic at the time of death. It was our purpose to determine whether or not the elevated post-mortem level of lactic acid is associated with a history of clinical hypoxia with sufficient consistency to warrant its use as a diagnostic test in man. The biochemical and physiologic mechanisms involved in the test are explained. Analyses of lactic acid in brain tissue were performed on 168 autopsied patients; clinical histories of the patients were recorded with special emphasis placed on the state of oxygenation of the tissues immediately ante mortem. The results indicated a high degree of correlation between clinical histories and lactic acid values. Normal non-hypoxic humans showed lactic acid levels between 119 and 209 mg. per 100 gm. brain tissue. Higher values strongly suggest exposure to hypoxia (if various interfering factors have been ruled out). (Author)

AD-261 557 Div. 16
(21 Aug 61) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
SUCCESSFUL PREGNANCY FOLLOWING HYPOPHYSECTOMY DURING THE TWELFTH WEEK OF GESTATION,
by Norman M. Kaplan. June 61, 12p. incl. table, 38 refs. (Review no. 4-61)
Unclassified report

DESCRIPTORS: *Pregnancy, *Pituitary gland, *Excision, Hormones, Excretion, Metabolism.

It appears that pregnancy can be successfully maintained and that lactation can occur in the human deprived of pituitary function. The usual alterations in hormonal metabolism during pregnancy seem primarily dependent upon placental activity. (Author)

AD-261 582 Div. 16
(30 Aug 61) OTS price $2.60

London U. (Gt. Brit.).
HYPOTHALAMIC AND FOREBRAIN AREAS RESPONSIBLE FOR CONTROL OF SECRETION OF THYROTROPHIC AND ADRENO-CORTICOTROPHIC HORMONES.
Summary rept. 1 May 56-30 Apr 61.
30 Apr 61, 21p. incl. table.
(Contract AF 61(514)953)
(AFOSR-1036) Unclassified report

DESCRIPTORS: *Brain, Nervous system, Physiology, Stimulation, Secretion, Electrodes, *Hormones.

Contents:
Hypothalamic control of TSH secretion: a study using remote control stimulation in conscious animals
Hypothalamic control of TSH secretion: a study using anaesthetized animals with implanted electrodes, and cannulation of an inferior thyroid vein
A sensitive in vitro technique for assaying TSH in body fluids
The effect of the vasopressor hormone of the posterior pituitary gland on thyroid activity
The possible humoral mechanisms by which the hypothalamus controls the secretion of luteinizing hormone in the rabbit
The possible humoral mechanism by which the hypothalamus controls the secretion of luteinizing hormone in the rat
The hypothalamic localization of a sexual behaviour center in female cats
The sexual behavior pattern of adult male and female rats subjected to hormone treatment when infantile

AD-261 608 Div. 16, 4, 25
(21 Aug 61) OTS price $3.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
DEVELOPMENT OF PHOTOREACTIVE MATERIALS FOR EYE-PROTECTIVE DEVICES,
by Richard E. Fox. Apr 61, 35p. incl. illus. tables (Rept. no. 61-67)
(In cooperation with The National Cash Register Co., Dayton, Ohio)
Unclassified report

DESCRIPTORS: *Eye, Atomic bomb explosions, *Light, *Injuries, Nuclear explosions, *Ultraviolet filters, Attenuation, Spiro compounds, Sensitivity, Heterocyclic compounds, Countermeasures, Absorption, Intensity, Spectrophotometers, Measurement, Monochromatic light, *Optical filters, Construction, Nitro radicals.

The primary purpose of this endeavor was to develop and select a material or a combination of materials that would afford aircrew members eye protection from intense light-flashes as occur during nuclear detonations. Synthetization of photochromic materials has resulted in over thirty compounds reactive to ultraviolet light. Spectral sensitivity measurements indicate that color formation is dependent upon the intensity of the activating light. Photo-induced ring closure (loss of coloring) was present only in

some photochromic compounds. Investigations of fatigue (gradual loss of photochromic properites) have been initiated. Studies of thermal kinetics indicate that: rate of color loss is independent of concentration, water inhibits rate of color loss, and nature and position of molecule substitutents affect rate of color disappearance. Photochromic material in film undergoes rapid interconversion between the colorless and colored states thereby demonstrating the possibility of a nonliquid photochromic filter. (Author)

AD-261 614 Div. 16
(18 Aug 61) OTS price $19.75

Walter Reed Army Inst. of Research, Washington, D. C.
ANNUAL PROGRESS REPORT VOLUME III, 1 JULY 1960-30 JUNE 1961.
30 June 61, 303p. incl. illus. tables, 95 refs.
Unclassified report

DESCRIPTORS: *Immunization, Medical equipment, Smallpox, Virus diseases, Tetanus toxoid, *Communicable diseases, Intestine, Diseases, Cholera, Typhoid, *Bacterial vaccines, *Disease carriers, Control, Ecology, Dental caries, Mouth, *Radiation injuries, Metabolism, Antigens, Antibodies.

AD-261 644 Div. 16
(18 Aug 61) OTS price $15.00

Walter Reed Army Inst. of Research, Washington, D. C.
ANNUAL PROGRESS REPORT, VOLUME II, 1 JULY 1960-30 JUNE 1961.
30 June 61, 223p. incl. tables, 110 refs. (Rept. no. MEDDH-288)
Unclassified report

DESCRIPTORS: *Communicable diseases, Respiratory diseases, Infections, Viruses, Virus diseases, Antibiotics, Drugs, Chemotherapeutic agents, Therapy, Diagnosis, Parasitic infections, Rickettsia, Mosquitoes.

AD-261 652 Div. 16
(22 Aug 61) OTS price $8.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
COUNTDOWN AND PROCEDURES FOR PROJECT MERCURY FLIGHT MR-2 (CHIMPANZEE SUBJECT),
by Norman E. Stingely. June 61, 89p. incl. illus. (AFMDC TR 61-20)
Unclassified report

DESCRIPTORS: Space capsules, *Space flight, Laboratory animals, *Mammals, Closed-cycle ecological systems, *Medical examination, *Space medicine, Diet, Training, Psychomotor tests, Physiology, Biochemistry, Clothing, Instrumentation, Preparation.

This report presents a countdown in abbreviated form with detailed procedure sheets necessary to define specific actions. These actions are necessary to ready a chimpanzee subject and couch for flight in the Project Mercury capsule and the post-flight release and care of the subject. The countdown and procedures not only describe the mechanics of preparing the subject and couch for flight, but also include a plan for obtaining a maximum of useful research data. Thus the biomedical adequacy of the Project Mercury capsule and a verification of ground, flight and recovery procedures could be determined, and the chimpanzees' physiology, biochemistry and psychomotor performance could be studied. During the preliminary phases of the Project Mercury Animal Support program, chimpanzees were subjected to temperature-humidity tests, psychomotor training, and acceleration-deceleration studies on a centrifuge and deceleration tracks. Considerable knowledge of the chimpanzees' physiology and behavior and invaluable experience in the use of Project Mercury hardware was gained during these exercises. The first drafts of this report were based on the above experiences. The final copy was updated from the experiences gained during dry runs and the actual MR-2 flight. (Author)

AD-261 739 Div. 16, 20
(22 Aug 61) OTS price $10.50

Smith, E. H., and Co., Inc., Silver Spring, Md.
NUCLEAR WEAPON CASUALTIES - EFFECTS ON PERSONNEL. Final rept.
1 May 61, 131p. incl. tables, 26 refs.
(Contract AF 33(600)39304)
Unclassified report

DESCRIPTORS: *Nuclear warfare, *Casualties, Gamma rays, Neutrons, Dose rate, *Radiation injuries, *Burns, Therapy, *Shock waves, Injuries, Survival.

Contents:
Casualties from nuclear radiation
  Early incapacitation from high doses of gamma rays and neutrons
  Acute and chronic effects of radiation
  The Relative Biological Effectiveness (RBE) of radiations
Thermal injury
  Thermal injury to bare skin
  Time to shock
  The protection afforded by clothing
  Clinical aspects of burn injury; incapacitation times; repair times; prognosis
Blast injury
  Translation injury
  Direct blast injury
Combined injuries

AD-261 756 Div. 16
(23 Aug 61) OTS price $1.60

Oregon U. Medical School, Portland.
MAINTENANCE OF CARBOHYDRATE STORES DURING STRESS OF COLD AND FATIGUE IN RATS PREFED DIETS CONTAINING ADDED GLYCINE,
by W. R. Todd. Mar 61, 14p. incl. tables, 10 refs.
(AAL TR 60-13) Unclassified report

DESCRIPTORS: Laboratory animals, *Diet, *Carbohydrates, Food, *Glycines, Exposure, Temperature, *Stress (Physiology), *Fatigue (Physiology), *Glycogen, Liver, Swimming, *Experimental data, Tissue (Biology), Enzymes, Muscles, *Amino acids, Insulin, Histidine, Alanines, Serine, Storage, Biosynthesis, Corticosteroids, Therapy, Labeled substances, Exercise.

Rats prefed for 36 or 48 hr on a synthetic diet containing 10% added glycine show a marked ability to maintain carbohydrate stores following stresses compared to animals fed the diet

without glycine. The stresses employed include a 24 hr fast, a large dose of insulin, cold, and cold with fatigue. During a 3-hr recovery period following the stress of swimming in cold water, rats prefed the glycine diet synthesize large amounts of liver glycogen. It is proposed that this represents increased glyconeogenesis. Adrenalectomized rats do not show this effect. However, after giving hydrocortisone the effect is again clearly evident, indicating that the adrenal cortex is involved in the phenomenon. When the swimming stress is shortened, the glycine effect is abolished. The prefeeding period on the glycine diet can be reduced to 24 hr, or possibly less, without eliminating this effect. Liver transaminase activity is the same in animals on the two diets after stress and following recovery after stress. (Author)

AD-261 757 Div. 16
(23 Aug 61) OTS price $1.60

Harvard U., Cambridge, Mass.
CIRCULATORY CHANGES IN THE 13-LINED GROUND SQUIRREL DURING THE HIBERNATING CYCLE,
by Charles P. Lyman and Regina C. O'Brien.
Apr 61, 18p. incl. illus. 12 refs.
(Proj. 8237-2)
(AAL TR 60-24) Unclassified report

DESCRIPTORS: Animals, *Mammals, *Sleep, Blood pressure, *Body temperature, Electrocardiography, *Circulatory system, Heart, Acetycholines, Epinephrine, Pharmacology.

This paper is a description of the changes which take place in the blood pressure, body temperature, and EKG during the hibernating cycle of the 13-lined ground squirrel (Citellus tridecemlineatus), and the effect of drugs during various parts of this cycle. (Author)

AD-261 758 Div. 16
(23 Aug 61) OTS price $3.60

George Washington U., Washington, D. C.
EFFECT OF LIPOTROPIC FACTORS ON COLD PHYSIOLOGY,
by Carleton R. Treadwell. Apr 61, 37p. incl. illus. tables, 15 refs.
(Proj. 7952-5)
(AAL TR 60-18) Unclassified report

DESCRIPTORS: *Physiology, *Exposure, *Diet, *Liver, Tissue (Biology), Muscles, Experimental data, Laboratory animals, Ketones, *Metabolism, Vitamins, *Growth, Stress (Physiology), *Lipids, Blood, Proteins, *Lipoproteins, Nutrition, Cholesterol, Acidosis, Phospholipids.

Several experiments have been carried out to study the lipotropic effect of cold upon fatty livers produced by deficiencies of methyl donors. It was found that at 1 C, diets containing as little as 5% protein and as much as 40% fat did not produce the fatty livers characteristic of these diets when fed at 25 C. It was also found that when animals with fatty livers were maintained at 1 C, there was a marked lipotropic effect without any change in diet composition. Cold also has both curative and preventive lipotropic effects on the triglyceride fraction of the livers of animals receiving diets which will produce cholesterol fatty livers. Other experiments suggest that animals at 1 C undergo an adjustment such that either larger amounts of ketone bodies can be metabolized or fewer ketone bodies are produced. (Author)

AD-261 805 Div. 16
(22 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETAILS OF THE LEGENDARY FLIGHT.
27 July 61, 25p. incl. illus. (Trans. no. MCL-1035 of Komsomol'skaya Pravda 91 (11031) pp. 1-3, 16 Apr 61)
Unclassified report

DESCRIPTORS: USSR, *Space flight, *Manned, *Satellite vehicles, *Space medicine, Astronautics.

AD-261 906 Div. 16
(24 Aug 61) OTS price $1.60

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
THE EFFECT OF TRANSIENT WEIGHTLESSNESS ON VISUAL ACUITY.
Rept. on Human Factors in Advanced Flight,
by Leroy D. Pigg and William N. Kama. Mar 61, 21p. incl. illus. tables.
(Proj. 7184)
(WADD TR 61-184) Unclassified report

DESCRIPTORS: *Visual acuity, Measurement, *Weightlessness, Gravity, *Space medicine, Space flight, Astronautics, Visual perception, Stress (Physiology), Space environmental conditions, Physiology, Tests.

Visual acuity was measured on subjects while they were exposed to short periods of weightlessness aboard an aircraft flown through zero-g trajectories involving transition from 1 g to 2-1/2 g to zero g. Monocular and binocular acuity of near and far vision were measured on both Snellen and checkerboard targets. Control measurements were made on the ground and inflight at 1 g in counter-balanced sequence with the zero-g measurements. Results show that the weightless environment produced for this study has a detrimental effect on visual acuity as measured. The decrement is not considered to have practical significance. (Author)

AD-261 983 Div. 16
(28 Aug 61) OTS price $1.60

Cincinnati U. Coll. of Medicine, Ohio.
THE USE OF FAT EMULSIONS FOR INTRAVENOUS ALIMENTATION AND THEIR PHYSIOLOGIC EFFECT IN HUMANS.
Annual progress rept. 1 June 60-31 July 61,
by John F. Mueller and Jack M. Iacono. 18 Aug 61, 17p. incl. tables.
(Contract DA 49-007-md-800)
Unclassified report

DESCRIPTORS: *Intravenous feeding, *Colloids, *Fats, Cancer, Erythrocytes, Blood plasma, Fatty acids, Blood platelets, Phospholipids, *Biochemistry, Hemorrhage, Anemia, Blood coagulation, Snake venom, Chromatographic analysis, Physiology.

The so-called long-term reaction to intravenous Lipomul limits the usefulness of an otherwise acceptible fat emulsion. Anemia and hemorrhagic phenomenon are important components of the reaction. In an attempt to elucidate the mechanism of the complications our laboratory has attempted to study biochemical changes in the red blood cell and platelet which might appear prior to the full blown syndrome. Thus, patients with advanced, but not terminal, carcinoma have been infused with 12 daily 500 cc. bottles of Lipomul.

The red cell and plasma fatty acids and the platelet phospholipids have been studied at appropriate intervals using a variety of available techniques. It has been possible to show that multiple infusions of Lipomul induce dramatic changes in the fatty acids of the blood. Linoleic acid rises precipitously while the other polyenes drop. Changes in the saturated fatty acids also occur. These changes do not occur when Lipomul is administered by oral route. The fact that the observed changes in red blood cells are reversible within 2-3 weeks indicates that this cell plays an active role in lipid transport under conditions of intravenous fat therapy and that such changes might be an etiologic factor in the anemia. (Author)

AD-262 007 Div. 16, 32, 3
(25 Aug 61) OTS price $5.60

Fordham U., New York.
SELECTED ABSTRACTS FROM SOVIET BIOMEDICAL JOURNALS NO. 6,
by Robert Pollitzer. June 61, 52p. incl. tables, 65 refs.
(Contract DA 18-108-405-cml-867)
Unclassified report

DESCRIPTORS: *USSR, Parasitology, *Epidemiology, Microbiology, Virus diseases, Encephalitis viruses, *Immunology, Disease carriers, Insects, *Communicable diseases, *Bibliography, Abstracting, Aerosols, Bacterial aerosols, Bacterial vaccines, Preventive medicine, Plague, Encephalitis, Antibiotics, Q fever, Ultrasonics, Vibration, Ecology, Tularemia, Brucellosis, Cholera, Laboratory animals, Virus vaccines, Ticks, Anthrax.

AD-262 035 Div. 16, 28
(30 Aug 61) OTS price $1.10

Goteborg U. (Sweden).
THE BIOCHEMICAL RELATIONSHIP BETWEEN NEUTRON AND ITS OLIGODENDROGLIA. MOLECULAR CHANGES IN THE RNA OF NERVE AND GLIA CELLS DURING LEARNING AND DURING EXPERIMENTALLY INCREASED RNA AND PROTEIN SYNTHESIS,
by Holger Hyden. 30 Apr 61, 11p. incl. tables, 15 refs.
(Contract AF 61(052)248)
(AFOSR-1104) Unclassified report

DESCRIPTORS: *Nerves, *Cells (Biology), *Nucleotides, *Proteins, Enzymes, Biochemistry, Glycolysis, Microanalysis, Microchemistry, Electrophoresis, Brain, Spinal chord, Energy, Learning, Biosynthesis, Biophysics.

Fresh, isolated nerve cells or oligodendroglia have been analyzed with respect to RNA nucleotides, protein, respiratory enzyme activities, anaerobic glycolysis and ATP-ase activity. The amount of RNA nucleotides and protein has been expressed as micromicrograms per cell. Several new methods for the micromicrograms-range are described. The biochemical composition and enzyme activities were found to differ considerably in the nerve cell compared with its glia. Quantitative as well as qualitative differences could be produced by stimulation even down to the molecular level. They were found to be inversely related in the two types of cells of the neuron-glia complex. Evidence is presented that the nerve cell and the glia constitute a metabolic symbiosis. From an energetic point of view they form a coupled system. Based on these findings, the results are presented from a study of changes during learning experiments in rats. (Author)

AD-262 071 Div. 16, 28
(30 Aug 61) OTS price $2.60

Lyons U. (France).
RESEARCH ON THE NEUROPHYSIOLOGICAL MECHANISMS OF SLEEP AND ATTENTION.
Final technical rept. Jan 59-Dec 60,
by Michel Jouvet. May 61, 48p. incl. illus. 73 refs.
(Contract AF 61(052)109)
(AFOSR-1103) Unclassified report

DESCRIPTORS: *Sleep, *Attention, Neurology, Laboratory animals, Man, Physiology, Brain, Pathology, Behavior, Stimulation, Electrodes.

Neurophysiological mechanisms of sleep: Investigations on cats and man have led to the discovery of a Ponto limbic system which is responsible for the fast cortical activity during sleep in cat, and for the oneiric activity in man. Neurophysiological mechanisms of attention: Depth recordings in the human brain have shown the existence of a central control of corticipetal afferent during attention. (Author)

AD-262 072 Div. 16
(30 Aug 61) OTS price $1.60

Pisa U. (Italy).
(No Title).
Annual summary rept. 15 June 60-14 June 61,
by Giuseppe Moruzzi. 5 July 61, 16p. 29 refs.
(Contract AF 61(052)107)
(AFOSR-1196) Unclassified report

DESCRIPTORS: *Vision, *Visual perception, Nervous system, *Physiology, Retina, Mammals, Stimulation, Electroencephalography, Birds, Eye, Behavior, Optic nerve, Laboratory animals, Optic tracts.

The habituation and the dishabituation of the visual responses to repetitive light flashes were investigated in the cerveau isole cat. The hypothesis of the habituation and of the release from dishabituation of the evoked visual potentials hinges upon the demonstration that the light striking the retina remains rigorously constant. The experiments on the relations between neurophysiology and animal behavior were concerned with the ocular manifestation of sleep in the owl placed in a dark, silent room. Experiments on the central influence of the retinal black-out on the central nervous system show that EEG synchronization increases following bilateral withdrawal of the retinal dark discharge in the cerveau isole cat, and following complete postcollicular transection, EEG activating structures, are still at work in the isolated cerebrum. The study of the effect of diffuse light and of the retinal black-out on the responses of the visual cortex elicited by lateral geniculate shocks led to the hypothesis that the effect of steady light is related with a decrease of the retinal dark discharge. Data suggest that steady light decreases the total retinal bombardment which was present in the dark adapted eye. (Author)

AD-262 076 Div. 16, 29
(25 Aug 61) OTS price $2.60

Quartermaster Research and Engineering Command, Natick, Mass.
PHYSIOLOGICAL RESPONSE CHANGES OF MEN ATTRIBUTABLE TO BODY ARMOR, SUN, AND WORK IN A NATURAL DESERT ENVIRONMENT (INCLUDING NEGRO-WHITE DIFFERENCES),
by Harold E. Hanson. June 61, 20p. incl. tables. (Technical rept. no. EP-148)
Unclassified report

DESCRIPTORS: *Body armor, *Heat tolerance, Desert tests, Perspiration, Body temperature, Physiology, Man, Climate, Exercise, Clothing.

Sweat production, rectal temperature and pulse rate were measured over a 24-consecutive-day period on 16 men (8 white and 8 negro) in both a natural and a modified (shaded) desert environment. These indices were used to determine the effect of wearing body armor, sun, and exercise, and to compare physiological responses of paired negro-white subjects. When an individual donned body armor, and exercised in a natural hot-dry desert environment, significant increases in sweat production, rectal temperature and pulse rate occurred. When an individual was exposed to the sun, significant increases in sweat production occurred. When an individual exercised, significant increases in sweat production, rectal temperature and pulse rate occurred. Heat tolerance of fully-clothed negro and white individuals was about equal in natural hot-dry surroundings. (Author)

AD-262 091 Div. 16
(30 Aug 61) OTS price $1.60

Weizmann Inst. (Israel).
THE MECHANISM OF PHOTOPHOSPHORYLATION IN CHLOROPLASTS,
by M. Avron. 30 Apr 61, 13p. 18 refs. (Technical rept. no. 1)
(Contract AF 61(052)390)
(AFOSR-1032) Unclassified report

DESCRIPTORS: *Phosphorylation, *Photochemical reactions, *Adenosine phosphates, Oxygen, Chlorophylls, Labeled substances, Ultraviolet radiation, *Nucleotides, Synthesis, Phosphorus compounds, Exchange reactions, Enzymes, Biochemistry.

Utilizing O-18 labelled substrates, it was established that 1 atom of O enters from the water of the medium into each ATP molecule produced. In addition the location of the phosphate oxygens, the possibility of interfering side reactions and the source of the new bridging oxygen atom in the ATP molecule were determined. The inhibitory effect of UV irradiation on the Hill reaction and photophosphorylation was quantitatively determined. A positive correlation was established between the destruction of coenzyme Q sub 255 and the inactivation of the photosynthetic reactions brought about by UV irradiation. By taking advantage of the properties of a photophosphorylative system, ATP or ADP labelled at specific and different sites with P-32 was synthesized. By a modification, the method could be used for the synthesis of many other P-32 labelled compounds. Light activated Pi-ATP exchange was discovered to be present in chloroplasts. (Author)

AD-262 144 Div. 16
(25 Aug 61) OTS price $2.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
THE CONTENT OF ADENINE NUCLEOTIDES AND CREATINE PHOSPHATE IN BRAIN. I. NORMAL AND ANESTHETIZED RATS. II. EFFECT OF CHLORPROMAZINE,
by Norman Weiner and Harriett N. Huls. May 61, 23p. incl. illus. tables, 105 refs. (Rept. no. 61-38 and 61-39)
(In cooperation with Harvard Medical School, Boston, Mass.)
Unclassified report

DESCRIPTORS: *Brain, Laboratory animals, Adenine, *Nucleotides, Creatine, *Phosphates, Recovery, Determination, Ion exchange, Chromatographic analysis, Enzymes, *Chlorpromazine, Metabolism, Inhibition, Pharmacology, Oxidases.

In unanesthetized rats killed by immersion in liquid oxygen, levels of adenosine monophosphate, adenosine diphosphate, adenosine triphosphate, and creatine phosphate in brain were 0.42, 0.66, 1.22, and 2.02 micromoles/gm., respectively. Adenosine triphosphate and creatine phosphate are incompletely extracted from brain by perchloric acid unless sufficiently large ratios of volume of acid to sample size are used. During the extraction of the frozen tissue, some breakdown of labile phosphate compounds is apparently occurring, in spite of efforts to avoid this. Decapitation before immersion of the severed head in liquid oxygen results in much lower levels of brain adenosine triphosphate and creatine phosphate and higher levels of adenosine monophosphate. Anesthesia with either ether or pentobarbital before immersion of the whole animal in liquid oxygen results in the recovery of higher brain levels of creatine phosphate but in no change in levels of adenine nucleotides as compared with control animals. The activities of adenosine triphosphatases and creatine phosphokinase in rat brain are sufficiently great to be capable of destroying in a few seconds all the adenosine triphosphate and creatine phosphate present. (Author)

AD-262 155 Div. 16
(30 Aug 61) OTS price $1.60

Army Medical Lab., Fort McPherson, Ga.
EPIZOOTIOLOGY AND BIONOMICS OF TRYPANOSOMA CRUZI INFECTIONS IN THE EASTERN UNITED STATES.
Annual progress rept. 15 Oct 60-30 June 61,
by Bryce C. Walton, Robert W. Upham and others, 30 June 61, 9p. incl. tables, 11 refs.
(Proj. no. 6X61-13-001)
Unclassified report

DESCRIPTORS: *Animals, Diseases, Etiology, *Trypanosoma, Parasites, *Parasitic infections, Identification, *Toxoplasma, Transmission, Protozoa, Communicable diseases, Diagnosis, Test methods.

A total of 78 animals of 6 species of wild animals trapped at Fort Stewart, Georgia was checked for Trypanosoma cruzi infection by culture of heart blood. Five of 29 raccoons (17%) were found to be infected. No positive cultures were found from any other species. A search for arthropod vectors was unsuccessful. A total of 51 animals of 5 species was tested by serological tests and mouse inoculation of brain homogenate for evidence of Toxoplasma gondii infections. Serum from 2 of 2 of 22 raccoons (9.1%) and 11 of 14 gray foxes (78.6%) showed titers of 1:64 or higher with Sabin-Feldman dye tests. No isolations were made by mouse inoculation. (Author)

Division 16 - MEDICAL SCIENCES

AD-262 156 Div. 16, 26
(30 Aug 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
FABRICATION OF A COMPOSITE DACRON ACRYLATE SEAMLESS COSMETIC GLOVE,
by Allen Winer. May 61, 6p. (Technical rept. no. 6111)
Unclassified report

DESCRIPTORS: *Prosthetics, *Gloves, Acrylic resins, Dacron, Plastics, Colors, Aging, Mechanical properties, Manufacturing methods, Laminates.

A novel and unique cosmetic glove has been developed. A special acrylate latex system which was developed at an earlier date at this laboratory was selected for this fabrication. This acrylate latex system has outstanding resistance to the deteriorating environmental conditions which usually cause vinyl gloves to yellow and stain. (Author)

AD-262 157 Div. 16
(30 Aug 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
BELOW-ELBOW COSMETIC CONDYLE-SUSPENDED PROSTHESIS,
by Robert E. Plumb and Theodore J. Bushey. June 1961, 7p. illus. (Technical rept. no. 6112)
Unclassified report

DESCRIPTORS: *Artificial limbs, Arms, Hands, Prosthetics.

The condyle-suspended prosthesis was developed to eliminate the extensive and sometimes uncomfortable operating and suspension harnesses. It is of particular appeal to those amputees who desire a prosthesis for cosmetic reasons. However this type of prosthesis can be so built to provide a means for operating the active mechanical terminal device. (Author)

AD-262 158 Div. 16, 26
(30 Aug 61) OTS price $1.60

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
EVALUATION OF THE PROCESS CONDITIONS OF THE FABRICATION OF SMOOTH-SURFACED POROUS LAMINATES,
by James T. Hill, July 61, 11p. incl. tables. (Technical rept. no. 6115)
Unclassified report

DESCRIPTORS: *Laminates, *Prosthetics, *Artificial limbs, Nylon, Vinyl alcohol, Polymers, Plastics, Resins, Porous materials, Materials, Aging, Processing, Manufacturing methods.

A new technique for preparing porous laminates with smooth surfaces was investigated. This method utilized a polyvinyl alcohol (PVA) sleeve for forming the smooth outer surface of the laminate. This sleeve was pulled over the laminate at the end of the precure cycle and allowed to remain until the laminate was sufficiently cured to maintain its surface contour. Additional curing, without the PVA sleeve is necessary to insure proper strength. Detailed processing conditions were determined. This new technique resulted in highly porous laminates with very similar surface appearance as nonporous laminates. (Author)

AD-262 162 Div. 16
(30 Aug 61) OTS price $4.60

Birmingham U. (Gt. Brit.).
ELECTROPHYSIOLOGICAL INVESTIGATION INTO THE ACTION OF CENTRAL STIMULANT AND TRANQUILLISING DRUGS.
Final technical rept.,
by P. B. Bradley. 31 May 61, 49p. incl. illus. table, 33 refs.
(Contract AF 61(514)1184)
(AFOSR-1034) Unclassified report

DESCRIPTORS: *Tranquilizing drugs, Brain, Stimulation, Electric potential, Laboratory animals, *Pharmacology, *Drugs.

Three main types of investigation have been carried out:- (1) Studies of the effects of drugs on conduction within the brain stem. Of the drugs studied, only two, thiopentone sodium and amphetamine had any significant effects. (2) Studies of the effects of central stimulant and tranquillising drugs on arousal responses. Three central excitant drugs, Preludin, Ritalin and Meratran were found to have similar effects to those of amphetamine and it is suggested that they have the same site of action. Of the tranquillisers studied, promazine, acepromazine and hydroxyzine were found to have similar effects on arousal thresholds to those of chlorpromazine and probably act in the same way. (3) Studies of the effects of drugs on conditioning and habituation to arousal stimuli in animals. In this investigation chlorpromazine was found to elevate thresholds for both unconditioned and conditioned afferent stimuli in producing arousal and eventually blocked these responses. Reserpine caused only a slight rise in threshold for the conditioned response but blocked the unconditioned response although this latter effect may have been partly due to habituation. (Author)

AD-262 265 Div. 16
(1 Sep 61) OTS price $1.60

Istituto Nazionale di Ottica, Florence (Italy).
ON THE RELIABILITY OF THE ELECTRORETINOGRAM AS A RESPONSE TO A LIGHT STIMULUS,
by Lucia Ronchi and Anna M. Ercoles. 1961, 7p.
(Contract AF 61(052)80)
(AFOSR-1256) Unclassified report

Presented at the 32nd Meeting of the Aerospace Medical Association, Chicago, Illinois, 24-27 April 1961.

DESCRIPTORS: *Retina, Stimulation, *Light, Intensity, Training, Psychology, Measurement, Vision.

A number of cases are reported where the shape of the human ERG appears as distorted and its size either enhanced or depressed, independently from the physical characteristics of the light stimulus and from the adaptation state of the retina. The results are interpreted by suggesting that unusual factors such as training and expectation may affect the ERG response. (Author)

AD-262 266 Div. 16
(1 Sep 61) OTS price $1.10

Istituto Nazionale di Ottica, Florence (Italy).
TRAINING AND ELECTRORETINOGRAPHIC RESPONSES,

by Lucia Ronchi and Anna Maria Ercoles. 1961, 6p.
(Contract AF 61(052)80)
(AFOSR-1257) Unclassified report

Presented at the Symposium of the ISC-ERG (International Society for Clinical Electroretinography) Stockholm, 1-3 June (1961).

DESCRIPTORS: *Retina, Vision, *Light, Stimulation, Intensity, Psychology, Training, Measurement.

A number of records are reported which seem to show a paradoxical influence of expectation on the electroretinographic responses. In particular, the initial records obtained from an untrained subject show a negative feature which tends to disappear during the various successive experimental sets, while the size of the positive feature tends to increase. It is tentatively suggested that the above reported changes correspond to the release, during incoming training, of central supression which is known to counteract the stimulation produced by intraocular scatter. (Author)

AD-262 278 Div. 16
(31 Aug 61) OTS price $1.60

Insect Control and Research, Inc., Baltimore, Md.
(No title).
Quarterly rept. no. 2, 1 Apr-30 June 61, by Eugene J. Gerberg. 6 July 61, 11p. incl. illus. tables.
(Contract DA 18-064-cml-2750)
Unclassified report

DESCRIPTORS: *Mosquitoes, Rearing, Growth, *Laboratory equipment, Containers, Food, Reproduction, Temperature, Life expectancy, Eggs.

17. METALLURGY

AD-261 528 Div. 17, 14
(21 Aug 61) OTS price $1.60

Horizons, Inc., Cleveland, Ohio.
STUDIES OF THE REINFORCEMENT OF METALS WITH ULTRA HIGH STRENGTH FIBERS (WHISKERS).
Bi-monthly engineering progress rept. no. 4, 1 June-31 July 61, by Bertram C. Raynes. 2 Aug 61, 10p. incl. table.
(Contract NOw 61-0207-c)
Unclassified report

DESCRIPTORS: *Metals, *Powder alloys, *Reinforcing materials, *Ceramic fibers, Fibers, Alloys, Powder metallurgy, Bonding, Binders, Aluminum compounds, Oxides, Nickel alloys, Chromium alloys, Heat resistant alloys, Processing, Wetting agents, Chromium, Manganese compounds, Soldering alloys, Mechanical properties, Heat treatment, Sintering, Boron alloys, Lithium alloys, Silver solders, Tensile properties, Wire.

Effort was directed toward developing a useful bond between the metal matrix and the whisker in a composite. Among several approaches being taken, an examination of certain high temperature brazing alloys was begun. A simplified means for obtaining elevated temperature tensile strengths of wires and small diameter bars is being worked out. (Author)

AD-261 534 Div. 17
(21 Aug 61) OTS price $1.10

New England Materials Lab., Inc., Medford, Mass.
HARD PARTICLE STRENGTHENING OF REFRACTORY METALS FOR HIGH TEMPERATURE USE THROUGH INTERNAL OXIDATION.
Progress rept. no. 1, 1 Jan-28 Feb 61, by A. S. Bufferd, K. M. Zwilsky, and N. J. Grant. 24 Mar 61, 6p.
(Contract NOw 61-0316-c)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, *Heat resistant alloys, *Refractory materials, *Powder alloys, *Dispersion hardening, Titanium alloys, Hardening, Oxygen, Diffusion, Oxidation, Oxides, Titanium compounds, Particles, Mechanical properties, Extrusion, Explosive forming, Non-destructive testing, Ultrasonics.

An investigation is being made of the technique of internal oxidation using Mo-1.5% Ti as the base composition. A mo-1.6% Ti ingot containing .024% C was received and is being converted by machining and dry ball milling to a fine powder. Internally oxidized Mo-1.5% Ti has been successfully extruded in a Dynapak and is currently being evaluated. (Author)

AD-261 559 Div. 17
(21 Aug 61) OTS price $1.60

Research Chemicals, Inc., Burbank, Calif.
RARE EARTH INTERMETALLICS.
Bimonthly rept. no. 3, 15 Mar-15 May 61. 15 May 61, 12p. incl. illus. tables (Rept. no. RC 179)
(Contract NOw 61-0257-c)
Unclassified report

DESCRIPTORS: *Intermetallic compounds, *Rare earth elements, Corrosion inhibition, Metal coatings, Phosphorus, Coatings, Preparation, Melting, Electric arcs, Boron compounds, Dysprosium, Silicon compounds, Phosphorus compounds, Hafnium compounds, Rhenium compounds, Yttrium compounds, Hafnium, Zirconium, Molybdenum, Yttrium, Rhenium.

Intermetallic compositions prepared by arc melting procedures include Dy-Si, Hf-Si, Hf-Re, Hf-B, and Yt-P. Samples with phosphorus coatings were also investigated. All of the phosphorus coated samples showed improvement in corrosion resistance over uncoated alloys. For Hf, the corrosion was reduced by a factor of 10, while for Zr, the corrosion was reduced by a factor of 2. The P coated Mo sample persisted for some time after the uncoated Mo sample was almost completely volatilized as molybdic oxide. Phosphorus coatings also improved the corrosion resistance of Yt metal. (Author)

AD-261 611 Div. 17, 26
(21 Aug 61) OTS price $4.60

Universal-Cyclops Steel Corp., Bridgeville, Pa.
MOLYBDENUM SHEET ROLLING PROGRAM.

Interim rept. no. 12, 26 Mar-25 May 61.
23 June 61, 46p. incl. illus. tables.
(Contract NOa(s) 59-6142-c)
Unclassified report

DESCRIPTORS: *Molybdenum, *Molybdenum alloys, Titanium alloys, Sheets, Manufacturing methods, Processing, Extrusion, Forging, Rolling mills, Plasticity, Mechanical properties, Chemical analysis, Tests, Controlled atmospheres, Test facilities, Temperature.

Additional forging of slugs by upsetting with a single 1750 ft-lb blow was conducted on both Mo+0.5%Ti and TZM in InFab and air. Maximum plasticity of as cast material in the cold work temperature region occurred at 2100 F and below. Minimum plasticity over the temperature range 1800F to 4075 F occurred at 3200 F. Cold worked and partially recrystallized slugs machined from a TZM alloy extrusion exhibited consistent plasticity from 1900 to 2400 F. Plasticity improved with temperature above this point. At 3650 F, a hot worked structure with a hardness of 190 DPH resulted. Decreasing plasticity with hold time at temperature in excess of 5 min was indicated at 2650 F. Essentially no difference was found between 0 and a 5-min hold up to 3200 F. At 3650 F there was a considerable increase in upset with 5-min hold for Mo+0.5%Ti but not with TZM. (Author)

AD-261 612 Div. 17, 26
(21 Aug 61) OTS price $8.10

Universal-Cyclops Steel Corp., Bridgeville, Pa.
MOLYBDENUM SHEET ROLLING PROGRAM.
Interim rept. no. 11, 26 Jan-25 Mar 61,
25 May 61, 84p. incl. illus. tables.
(Contract NOa(s) 59-6142-c)
Unclassified report

DESCRIPTORS: *Molybdenum, *Molybdenum alloys, Titanium alloys, Sheets, Manufacturing methods, Processing, Extrusion, Forging, Rolling mills, Melting, Crystal structure, Grains (Metallurgy), Tensile properties, Surface properties, Microstructure.

It was demonstrated that 0.060-in. Mo+0.5%Ti sheet can be fabricated from 8- and 12-in.-diam. single melt ingots and 12-in.-diam. double melt ingots by a variety of primary fabrication practices to produce sheet bars including direct extrusion to sheet bar as well as extruding to an intermediate round followed by forging or rolling to sheet bar. These operations were performed on conventional facilities at 2250 F or below. The average of the various process yields from conditioned ingot to finished sheet were 68% for extruded sheet, 49% for forged sheet, and 45% for rolled sheet bars, respectively. The 8-in. ingot contained the most uniform fine-grained structure. Tensile properties varied only slightly when compared to ingot melting practice. Initial recrystallization and the related drop in hardness was approximately 100 F higher for the 8-in. single melt ingot. (Author)

AD-261 768 Div. 17, 25, 26
(22 Aug 61) OTS price $10.50

Aerospace Technical Intelligence Center,
Wright-Patterson Air Force Base, Ohio.
SOLIDIFICATION OF METALS (SELECTED ARTICLES)
(Zatverdyvaniye Metallov).
9 Mar 61, 135p. incl. illus. tables, 45 refs.
(Trans. no. MCL-131 of Gosudarstvennoye Nauchnno-Tekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moscow, pp. 176-214, 231-242, 299-309, 374-396 and 480-483, 1958)
Unclassified report

DESCRIPTORS: *Castings, *Casting, Aluminum alloys, Silcon alloys, Brass, Bronze, Copper alloys, Tin alloys, Magnesium alloys, Molding, Dies, Hydrostatic pressure, Pressure, Phase transitions, Crystallization, Solids, Liquids, Steel, *Steel castings, Crystal structure, Grains (Metallurgy), Nucleation, Temperature, Growth, *Metals.

Contents:
Solidification of nonferrous alloy castings under pressure
Studying the thermal conditions of solidification of castings in investment molds
On the effect of admixtures on the crystallization of a steel ingot
Investigating the effect of metal solidification in the process of mold filling on the quality of steel castings
Production of steel blanks by die-pressing during crystallization

AD-261 772 Div. 17
(23 Aug 61) OTS price $9.10

Aerospace Technical Intelligence Center,
Wright-Patterson Air Force Base, Ohio.
SPECIAL STEELS AND ALLOYS - COLLECTION OF WORKS, NO. 17 (SELECTED ARTICLES) (Spetsial'nyye Stali I Splavi Sbornik Trudov No. 17).
27 Feb 61, 103p. incl. tables, 12 refs. (Trans. no. MCL-711 of State Scientific and Technical Publishing Office for Literature on Ferrous and Nonferrous Metallurgy, Moscow, 1960, pp. 327-357, 398-418 and 472-488)
Unclassified report

DESCRIPTORS: *Alloys, *Steel, *Nickel alloys, *Molybdenum alloys, Additives, Silicon alloys, Chromium alloys, Corrosion resistant alloys, Phase transitions, Mechanical properties, Deformation, Physical properties, Crystal structure, Plasticity, Iron alloys, Aluminum alloys, Deoxidation, Barium alloys, Calcium compounds, Electrical properties, Electron tubes, Heat treatment, Wire, Drawing (Machine processing), Tungsten alloys, Titanium alloys, USSR.

Contents:
Properties and peculiarities of special alloys with high nickel and molybdenum content, by Yu. M. Chizhikov
The effect of barium and calcium on the life of nichromes, by M. V. Pridantsev and A. V. Merlina
Alloys replacing molybdenum in the radio industry, by D. A. Teymer
Structural transformation in nickel-base alloys, by L. N. Zimina and M. V. Pridantsev

AD-261 778 Div. 17, 26
(22 Aug 61) OTS price $10.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING INDUSTRY (SELECTED CHAPTERS),
by Yu. A. Maslov. 31 Jan 61, 133p. incl. illus. tables, 23 refs. (Trans. no. MCL-805 of Svarschnoe Proizvodstvo, Moscow, pp. 1-53, 102-116, 169-202, 217-240, 1959)
Unclassified report

DESCRIPTORS: *Welding, Electric welding, Industrial production, Cutting torches, Gases, Metals, Metal joints, Welded joints, Automation, Welds, Quality control, Manufacturing methods, Electric arcs, USSR, Machines, Textbooks, Deformation, Stresses.

The book contains data on manual arc and automatic welding, electric resistance welding, gas welding and cutting. In it is described the history and the development of welding, the technology of welding steel, cast iron and nonferrous metals, data on deformation and stresses during welding, electrowelding and gas-welding equipment, quality control of welding, as well as technical-economical bases of welding processes and safety measures during welding operations. The book appears to be a scientific aid on the Course of Welding for students of machine building plants and schools dealing in non-welding specialties, and can also serve as a textbook for foremen and technologists connected with industrial problems of welding. (Author)

AD-261 790 Div. 17
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE HARDNESS OF CERTAIN NIOBIUM-BASE ALLOYS AT ELEVATED TEMPERATURES,
by I. I. Kornilov and R. S. Polyakova. 5 June 61, 6p. incl. illus. (Trans. no. MCL-945 of Atomnaya Energiya 10:170-172, 1961)
Unclassified report

DESCRIPTORS: *Niobium alloys, Molybdenum alloys, Zirconium alloys, Silicon alloys, Aluminum alloys, *Hardness, High temperature research, Heat treatment, Microstructure, Solids, Solutions, Niobium, Test methods, Measurement, USSR, Preparation.

An investigation was made of the changes in the hardness of Nb and Nb alloys with temperature by the method of hot hardness. A series of Nb alloys were prepared from Nb (99.2%), Mo (99.9%), Zr (99.8%), Si(technical grade), Al (99.9%) and carbon by arc fusion. The specimens were remelted several times and homogenized in a TVV-2 vacuum furnace at 1600 C for 10 hr. Hardness measurements were carried out on a VIM-1 instrument under vacuum at 20, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 C. The impressing time of the diamond pyramid was 1 min. Three impressions were made on the specimen at each temperature. The diagonal of the impression was determined on a PMT-3 instrument for measuring microhardness. It was concluded that (1) Nb, like Ni, Fe, and Co can be hardened by alloying with components which form with it solid solutions with separation of the excess phase; (2) the method of hot hardness makes it possible to characterize the strength of alloys at elevated temperatures; and (3) multicomponent alloys with a high hardness at 1000 C require further investigation and testing for heat resistance by the standard method.

AD-261 791 Div. 17
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METALLOCHEMICAL PROPERTIES OF NIOBIUM,
by I. I. Kornilov. 26 June 61, 6p. (Trans. no. MCL-948 of Doklady Akademii Nauk SSSR 135:1399-1401, 1960)
Unclassified report

DESCRIPTORS: *Niobium, Niobium alloys, Niobium compounds, Chemical reactions, USSR, Transition elements, Nuclear states, Crystal structure, Thermodynamics, Physical properties, Chemical bonds, Metallurgy.

The metallic properties of Nb are discussed, and the elements of the periodic system are classified according to the types of their interaction with Nb. The basic characteristics of the metallochemical properties of the elements considered were the electron structure of the atom, the atomic radii, the electrical negativity, the types of crystalline structure, and the fusion temperatures. Nb, a metal of the transition group, has an incomplete outer d-electron shell. The atomic radius of Nb is 1.45 Angstroms. With respect to electrical negativity Nb occupies a middle position. About 35 metals with relation to Nb are electrically positive, and about 37 are electrically negative. Nb has a cubic-centered lattice and a melting point of 2,415 C. The degree of affinity and difference of these metallochemical properties of Nb which result from the position of Nb with respect to the elements in the periodic system, determines the possible types of interaction. On the basis of a generalization of the published material on the chemical reaction of Nb with the elements of the periodic system, a classification of these elements was made from the point of view of their interaction with Nb. (Author)

AD-261 792 Div. 17
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINING THE ENTHALPY AND SPECIFIC HEAT CAPACITY OF BERYLLIUM IN THE INTERVAL 600--2,200 DEGREES K,

Division 17 - METALLURGY

by P. B. Kantor, R. M. Krasovitskaya, and A. N. Kisel', 27 June 61, 6p. incl. table. (Trans. no. MCL-950 of Fizika Metallov I Metallovedeniye 10:835-837, 1960)
Unclassified report

DESCRIPTORS: *Beryllium, Enthalpy, Specific heat, Phase transitions, Melting, Liquid metals, Solids, *Thermodynamics, USSR.

Results are presented of the experimental determination of the enthalpy of pure beryllium in the temperature interval 600--2,000 K in the solid and liquid states, as well as for the melting point and the heat of the transition phase. The coefficients of interpolation equations for the enthalpy and the heat capacity of beryllium in the interval of temperature indicated are reported. (Author)

AD-261 793 Div. 17
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HIGH-TEMPERATURE OXIDATION OF ALLOYS WITH HIGH MELTING POINT. INSTALLMENT II. ALLOYS OF TUNGSTEN WITH ZIRCONIUM,
by R. F. Voytovich. 27 June 61, 5p. (Trans. no. MCL-951 of Fizika Metallov i Metallovedeniye 10:862-865, 1960)
Unclassified report

DESCRIPTORS: Heat resistant alloys, *Tungsten alloys, *Zirconium alloys, Oxidation, USSR, *Zirconium, *Tungsten, Oxygen, Oxides, High temperature research, Metallurgy, Reaction kinetics, Chemical reactions.

AD-261 794 Div. 17
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
REFINING METALLIC LITHIUM,
by T. F. Fedorov and F. I. Shampay. 25 July 61, 10p. incl. tables (Trans. no. MCL-953 of Izvestiya Akademii Nauk SSSR - Otdeleniye Tekhnicheskikh Nauk - Metallurgiya I Toplivo 6:56-60, 1960)
Unclassified report

DESCRIPTORS: *Lithium, *Purification, *Fractionation, *Separation, Chemical impurities, Vaporization, Distilling plants, Potassium, Sodium, Alkali metals, Metallic smoke deposits, USSR, Vacuum apparatus, Preparation.

Li obtained by electrolytic and heat-extraction methods seldom has a content of the basic substance above 99%. The following ways of obtaining pure Li are possible: chemical methods of the purification of original compounds, vacuum distillation, or rectification and zonal recrystallization. Some results in the refining of metallic lithium by distillation are discussed. Vacuum distillation lowers the content of Na and K in Li to 0.1%, but vacuum distillation with fractional condensation of the product lowers it to 0.01%. The rectification of Li assures the obtaining of a metal of high purity, above 99.99% pure. (Author)

AD-261 795 Div. 17, 26
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CUTTING COPPER BY A CONCENTRATED ARC,
by D. G. Bykhovskiy and M. G. Fridlyand. 14 July 61, 4p. (Trans. no. MCL-954 of Vestnik Elektropromyshlennosti 1:55-57, 1961)
Unclassified report

DESCRIPTORS: *Copper, Processing, Electric arcs, Cutting tools, Heat transfer, Thermal conductivity, Plasma jets, *Cutting torches, Gases, Hydrogen, *Copper alloys, USSR.

Laboratory and Industrial experience in the use of plasma generators showed that the use of the concentrated arc for cutting Cu and its alloys makes possible an increase in the productivity of the work by a factor of 15 to 20 as compared with existing methods. It considerably reduces the amount of metal which goes into scrap, since the width of the cut in cutting with the concentrated arc is a half or a third of that of mechanical cutting. (Author)

AD-261 803 Div. 17
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRUCTURE AND PROPERTIES OF NIOBIUM-ALUMINUM ALLOYS,
by V. V. Baron and Ye. M. Savitskiy. 14 July 61, 9p. incl. tables (Trans. no. MCL-1003 of Zhurnal Neorganicheskoy Khimii 6:pp. 182-185, 1959)
Unclassified report

DESCRIPTORS: *Niobium alloys, *Aluminum alloys, Phase studies, Phase transitions, Eutectics, Intermetallic compounds, Aluminum compounds, Niobium compounds, Physical properties, Resistance, Electrical properties, Hardness, Crystal structure, Microscopy, Thermodynamics, X-ray spectroscopy, Measurement, USSR, Transition elements, Superconductivity, Microstructure.

Microscopic, thermic, and X-ray techniques, and measurement of the hardness and electrical resistance of cast and tempered alloys were used to construct a phase diagram of the alloys of Nb and Al. Three compounds, Nb3Al, Nb2Al, and NbAl3 were detected. Nb3Al and Nb2Al were formed at 2,120 ± 10 C and 1,890 ± 10 C, respectively, in accordance with a peritectic reaction, NbAl3 crystallized from the fusion at 1,660 ± 10 C. The solubility of Al in Nb at 2,190 C was about 6 wt-%, and it decreased to 4.5% at room temperature. The eutectic between the compounds Nb2Al and NbAl3 formed at 1,1630 ± 10 C. NbAl3 and Al formed a fusible eutectic (565 C) which was displaced toward Al (1 wt-% Nb). The hardness and the electrical resistance of Nb increased with an increase in Al. In the region of the compounds (from 8 to 45 wt-% the hardness was 450 to 500 kg/sq mm, and the electrical resistance was 220 to 300 micro-ohms/cm. (Author)

AD-261 808 Div. 17, 25, 26
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE ROLE OF FRICTION WHEN WELDING WITH ULTRASOUND (O Roli Treniya Pri Svarke Ul'trazvukom),

by G. F. Balandin and L. L. Silin. 26 June 61, 8p. (Trans. no. MCL-1045 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo 6, Moscow, pp. 42-46, 1960)

Unclassified report

DESCRIPTORS: *Welding, Ultrasonics, Friction, *Welded joints, Metal joints, Welds, Plastic flow, Surface properties, Diffusion, Mechanical properties, Crystal structure, USSR, Heat transfer.

AD-261 809 Div. 17
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTRIC AND GALVANOMAGNETIC PROPERTIES OF DILUTED SOLID SOLUTIONS (Elektricheskiye i Gal'vanomagnitnye Svoystva Razbavlennykh Tverdykh Rastvorov),
by Ye. G. Okonnikov. 27 June 61, 11p. (Trans. no. MCL-1053 of Trudy Akademii Nauk SSSR, Institut Metallurgii 6, Metallurgiya, Metallovedeniye, Fiziko-Khimicheskiye Metody Issledovaniya, pp. 32-40, 1960)

Unclassified report

DESCRIPTORS: *Silver alloys, *Palladium alloys, *Iron alloys, *Tungsten alloys, Solids, Solutions, Resistance, Magnetic fields, USSR, Magnetic properties, Electromagnetic properties, Temperature, Thermoelectricity, Hall effect.

The electric resistance in weak (diluted) solid solutions of the Pd-Ag and Fe-W systems, as well as the Hall effect in a Pd-Ag system, have been investigated. (Author)

AD-261 821 Div. 17
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
VACUUM REFINING OF NIOBIUM,
by R. A. Ul'yanov, Ye. P. Nechiporenko, and N. D. Tarasov. 27 July 61, 7p. incl. illus. table. (Trans. no. MCL-1145 of Fizika Metallov i Metallovedeniye 2:461-464, 1961)

Unclassified report

DESCRIPTORS: *Niobium, Purification, Mechanical properties, Electrical properties, Impurities, Chemical impurities, Physical properties, Preparation, Processing, Melting, Powder metals, Powder metallurgy, Sintering, Microstructure, Hardness, Tensile properties, USSR, Vacuum furnaces.

Conclusions: As a result of vacuum refining at 2300 to 2350 C, not only the adsorbed and dissolved gases are removed from the Nb, but also such impurities as Pb, Si, and Fe; and Arc fusion of the refined Nb in neutral media purified by passage through fused Li protects the metal from contamination by impurities. (Author)

AD-261 831 Div. 17, 25
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINATION OF THE RATE OF DIFFUSION OF HYDROGEN THROUGH 1Kh18N9T STEEL AT HIGH TEMPERATURES AND PRESSURES,
by Yu. I. Archakov, I. D. Grebeshkova, and V. P. Teodorovich. 27 July 61, 9p. incl. illus. table, 11 refs. (Trans. no. MCL-1183 of Zhurnal Prikladnoy Khimii 34:821-826, 1961)

Unclassified report

DESCRIPTORS: High pressure research, High temperature research, Steel, *Hydrogen, *Diffusion, Measurement, Test equipment, USSR, Test methods, Determination.

A method was developed for determining the rate of diffusion of H through various steels at high temperatures and pressures. The principal feature of the method was the avoidance of welded joints on the computational surface of the metal through which the gas diffuses. The rate of diffusion of H through 1Kh18N9T steel was studied at 500 C with H pressures to 300 kg/sq cm, at 600 to 800 C and pressures to 200 kg/sq cm, at 900 C and 100 kg/sq cm, at 950 C and 75 kg/sq cm and at 1000 C and 50 kg/sq cm on 6 tubular samples. The difference in the values of the rate of diffusion during the testing of various samples did not exceed ± 5%. There was a parabolic dependence between the rate of H diffusion and the H pressure within the tubular sample. (Author)

AD-261 882 Div. 17, 26
(24 Aug 61) OTS price $1.10

Reactive Metals, Inc., Niles, Ohio.
THE MANUFACTURE OF Ti-6Al-4V, Ti-2.5Al-16V AND Ti-8Al-8Zr-1 (Ta+Cb). AMENDMENT 3. INVESTIGATION OF WELDABILITY OF ONE-INCH THICK TITANIUM 6Al-4V PLATE.
Bimonthly rept. no. 29, 25 Mar-25 May 61,
by L. E. Stark, L. J. Bartlo, and H. G. Porter. June 61, 1p.
(Contract NOa(s) 56-994-c)

Unclassified report

DESCRIPTORS: *Titanium alloys, Aluminum alloys, Vanadium alloys, Sheets, Welding, Welds, Production, Manufacturing methods, Processing.

All material from one-inch Ti-6Al-4V plate needed for use in welding evaluation has been flame-cut, flattened, and cleaned. The balance of the one-inch thick plate will be stocked in the as-rolled condition pending disposition by the Bureau of Naval Weapons. Two weldments have been completed and the welds were cut out in preparation for laboratory tensile testing. (Author)

AD-261 883 Div. 17, 26, 31
(24 Aug 61) OTS price $1.10

Republic Steel Corp., Canton, Ohio.
DEVELOPMENT OF FUSION WELDING TECHNIQUES FOR TWO INCH THICK TITANIUM PLATES (GRADE RS70, COMMERCIALLY PURE).
Bimonthly rept. no. 5, 1 Jan-28 Feb 61,
by J. Savas. Mar 61, 55p. incl. tables.
(Contract NOa(s) 60-6091-f)

Unclassified report

DESCRIPTORS: *Titanium, *Titanium alloys, *Welding, Welded joints, Welds, Arc welding, Metal plates, Heat treatment, Radiography, Ship hulls, Ship plates, Submarine hulls, Tensile properties, Processing.

Division 17 - METALLURGY

AD-261 987 Div. 17, 26
(25 Aug 61) OTS price $1.10

Chase Brass and Copper Co., Inc., Waterbury, Conn.
THE DEVELOPMENT OF FABRICATING TECHNIQUES FOR PRODUCING HIGH PURITY RHENIUM STRIP 6'' x 6'' x 0.005''.
Quarterly rept. no. 4, 1 Apr-30 June 61, by A. H. Springmeyer and J. H. Port. 25 July 61, 4p. illus.
(Contract NOa(s) 60-6066-f)
Unclassified report

DESCRIPTORS: *Rhenium, Sheets, Processing, Production, Rolling mills, Powder metallurgy, Powder metals, Hydraulic presses, Sintering, Purification, Vacuum furnaces, Contamination, Impurities, Tantalum, Tungsten, Melting, Electron beams, Chemical analysis, Physical properties, Spectrographic analysis.

Four sintered compacts of Lot #210 Re powder were cold rolled to 0.014-in. gage. Further fabrication was discontinued because of small cracks and other imperfections. Chemical analysis indicated that these failures were caused by Ta contamination introduced during the sintering operation. Two additional compacts were made and sintered in a manner that would insure against any contamination of this type. One of these compacts was successfully fabricated to 6- x 6- x 0.005-in. sheet. The other compact was rolled to 0.005-in. gage but samples were removed at various stages of reduction for subsequent chemical analysis and therefore a full 6-in. square sheet could not be made. Two samples of electron-beam melted ingot were rolled to 0.085-in. gage, one at room temperature and the other at 300 to 500 F. The warm rolled sample fabricated slightly better than the other sample in that the amount of edge cracking was somewhat less. These samples will be rolled to 0.005-in. gage. (Author)

AD-262 199 Div. 17, 25
(30 Aug 61) OTS price $4.60

Uppsala U. (Sweden).
X-RAY INVESTIGATIONS OF THE TERNARY SYSTEM Fe-P-B. SOME FEATURES OF THE SYSTEMS Cr-P-B, Mn-P-B, Co-P-B AND Ni-P-B,
by Stig Rundqvist. 17 June 61, 43p. incl. illus. tables, 37 refs. (Technical note no. 24)
(Contract AF 61(052)40)
(AFOSR-692) Unclassified report

DESCRIPTORS: *Alloys, *Iron alloys, *Phosphorus alloys, *Boron alloys, *Chromium alloys, *Manganese alloys, *Cobalt alloys, *Nickel alloys, X-ray diffraction analysis, Transition elements, Chemical analysis, Crystal structure, Determination, Solubility, Solids, Phase studies, Preparation.

The solid region of the Fe-P-B system was investigated in the range Fe-FeP2-BP-FeB-Fe by means of x-ray and chemical analyses. The main features of an isothermal section at 1000 C have been determined. Boron substitutes for P to a large extent in Fe3P and to a smaller extent in Fe2P and FeP. Two ternary phases exist, Fe5PB2 and Fe3P sub 1-x B sub x, where the phase is homogeneous when x ranges between 0.48 and 1. Solid solubility of B is appreciable in Cr3P and Mn3P, but is very restricted in Ni3P. The ternary phase Mn5PB2 is isostructural with Fe5PB2. In the Co-P-B system, 3 ternary phases have been found, Co3P sub 1-x B sub x, Co3P sub 1-y B sub y, and Co5PB2. The crystal structures of Fe3P0.37B0.63 and Fe5PB2 were determined and refined using single-crystal methods. (Author)

AD-262 241 Div. 17, 26
(31 Aug 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
IMPROVED SINTERED BRASS COMPACTS (PART II),
by R. A. Powell and F. I. Zaleski. May 61, 24p. incl. illus. table (Technical rept. no. R-1503A)
(Proj. TB4-002B)
Unclassified report

DESCRIPTORS: *Brass, Mechanical properties, Powder alloys, Copper alloys, Zinc alloys, Microstructure, Powder metallurgy, Processing, *Sintering, Sintered alloys, Physical properties, Grains (Metallurgy), Additives, Molding materials, Lubricants, Metallic soaps, Lithium compounds, Stearates, Tensile properties, Density.

It was previously reported in report R-1503 (AD-216 495) that substantially higher tensile properties were obtained with sintered 70% Cu-30% Zn brass compacts when lithium stearate, rather than the conventional zinc stearate, was used as the lubricant. In the current investigation it was found that further improvements in the properties of brass compacts were possible with higher sintering temperatures or longer periods of time with either a nitrogen or air furnace atmosphere. The highest properties attained in the sintered brass for the two optimum sintering conditions approach those of annealed wrought 70-30 brass. A study was made of the changes in microstructure of the brass with various sintering temperatures and periods of time. The significance of microstructure as an aid in predicting properties of sintered brass was apparent. (Author)

AD-262 244 Div. 17, 22
(30 Aug 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
FRACTURE TOUGHNESS OF 4330V (Mod + Si) STEEL UNDER PLANE STRAIN CONDITIONS,
by C. M. Carman. June 61, 17p. incl. illus. 12 refs. (Rept. no. R-1591)
(Proj. TS4-4024)
Unclassified report

DESCRIPTORS: *Steel, *Fracture (Mechanics), Plasticity, Deformation, Tensile properties, Theory, Mathematical analysis, Heat treatment, Chemical analysis, Test methods, *Ordnance steel, Recoilless rifles, Stresses.

An investigation was conducted to study size effects in notch tension testing and to determine the fracture toughness of 4330V (Mod + Si) steel under plane strain conditions. Fracture studies using circumferentially notched round specimens (0.505, 0.750, and 3 in. in diameter) of 4330V (Mod + Si) steel tempered at 600 and at 850 F, are described. Using the mathematical model including plastic strain zone correction proposed by Irwin (Plastic Zone Near a Crack and Fracture Toughness, Contribution to 7th Sagamore Conference, 1960) the data were analyzed and the fracture toughness values were computed. Good agreement was found between fracture toughness

values for the small specimens, but a somewhat lower value was found for the 3-in. specimens. This deviation is discussed in light of statistical size effects. (Author)

AD-262 296 Div. 17, 27, 12
(31 Aug 61) OTS price $2.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
STRESS CORROSION OF HIGH STRENGTH STEELS AND ALLOYS; ARTIFICIAL ENVIRONMENT.
Monthly scientific progress rept. no. 13 for July 61,
by C. J. Owen, W. D. Ruble and others. July 61, 22p. incl. tables
(Contract DA 36-034-ORD-3277, Proj. 389-1)
Unclassified report

DESCRIPTORS: *Steel, Alloys, *Corrosion research, Corrosion, Corrosion inhibition, Corrosive gases, Corrosive liquids, *Rocket cases, Airframes, Guided missiles, Materials, Stresses, Titanium alloys, Stainless steel, Physical properties, Heat treatment, Mechanical properties, Chemical analysis, Sheets.

Stress corrosion tests are being made on high-strength steels and alloys (missile case materials) under synthetic environments. Polyethylene containers are being used for the exposure of U-bend specimens to solutions of NaCl, NaNO3, Na2SO4, NaPO3, and Na2S. Chemical analysis data are presented for Ladish D6Ac, 300M, Vascojet 1000, AM355, PH15-7Mo, B120VCA, 4137Co, Rocoly 270, and Ardeform 301. U-bend stress corrosion tests are progressing on 4137 Co, AM355, PH15-7Mo, B120VCA, and Ardeform 301. Bent beam specimens of 4137 Co and AM 355 are still under test. No failures were observed on bent beam specimens of AM355 (secondary direction) cold-rolled to 250, 261, 302 Kpsi strength levels. Little change was noted in the bent beam specimens of 4137 Co exposed to 3 natural environments (marine, semi-industrial, and industrial). Data are presented for U-bend specimens of AM355 (primary direction, lowest yield strength). No failures were observed with B120 VCA U-bend specimens (secondary direction, 135 Kpsi yield strength). Cumulative data are presented for U-bend specimens of PH15-7 Mo and AM 355 tested in CCl4, C5H12, and C2H2Cl4, in addition to the 5 test solutions. A susceptibility to corrosion in NaCl was indicated for Ardeform 301, and in NaNO3 and NaPO3 for 4137 Co.

AD-262 297 Div. 17, 27, 12
(31 Aug 61) OTS price $7.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
STRESS CORROSION OF HIGH STRENGTH STEELS AND ALLOYS; ARTIFICIAL ENVIRONMENT.
Annual scientific progress rept. no. 12, 1 July 60-30 June 61,
by C. J. Owen, W. D. Ruble, and others.
30 June 61, 65p. incl. illus. tables.
(Contract DA 36-034-ORD-3277, Proj. 389-1)
Unclassified report

DESCRIPTORS: *Steel, Alloys, *Corrosion research, *Rocket cases, Airframes, Materials, Guided missiles, Stresses, Corrosion, *Titanium alloys, Corrosion resistant alloys, Mechanical properties, Microstructure, Surface properties, Corrosion inhibition, Corrosive gases, Corrosive liquids, Test methods, Heat treatment, Physical properties.

Objectives, test methods, and apparatus are presented for research in the field of stress corrosion for high strength steels and alloys. All data accumulated during the contract year are given. The chemical analyses and physical properties of the assigned steels and alloys, including D6Ac, 300 M, Vascojet 1000, AM355, PH15-7 Mo, and B120VCA, are shown. Other missile materials, including 4137 Co, H270 and Ardeform 301, are also included in the survey. The heat-treating surveys for all alloys were completed, and the data are given in both tabular and graphical form. Cumulative U-bend and bent beam test data on a number of the foregoing materials are presented. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-261 620 Div. 18, 30
(21 Aug 61) OTS price $5.60

Technical Operations, Inc., Washington, D. C.
PLAYER PARTICIPATION GAMING IN LIMITED WAR APPLICATIONS,
by Alan G. Eddy and Paul C. Hewett. 16 Feb 61, 51p. (Staff memo. no. 61-1)
(Contract AF 33(600)41896)
Unclassified report

DESCRIPTORS: *Games theory, Computers, Programming, Warfare, Simulation, Military requirements.

This paper defines a feasible approach to developing a facility for gaming limited wars, with particular emphasis on United States Air Force participation in such wars. It discusses some special circumstances associated with limited wars and the effects of these special circumstances on the requirements for a war gaming facility designed for limited war analysis. Three approaches to the problem of gaming limited wars are compared - the highly automated, one or two-sided, closed game; the closed, two-sided manual game; and the open, manual war game. An approach is proposed which provides each of these three capabilities as progressive steps in a developmental program. An appendix, listing and briefly describing some of the major current war gaming activities, is included. (Author)

AD-261 621 Div. 18, 30
(21 Aug 61) OTS price $4.60

Technical Operations, Inc., Washington, D. C.
THE APPLICATION OF ANALOG COMPUTERS TO AIR BATTLE PROBLEMS,
by John C. Sessler. July 61, 40p. incl. illus. tables (Staff memo. no. 61-4)
(Contract AF 33(600)41896)
Unclassified report

DESCRIPTORS: Warfare, Simulation, *Analog computers, Test equipment, Games theory, *Air combat analyzers.

Investigation of the utility of analog models has led to the development of an exploratory model -- a simplified, approximate simulation of a two-sided global war. The total forces on a side are contracted to one location, with all capabilities on that base. Damage can be distributed in any proportion between the offensive and defensive capabilities, and the vari-

ous interactions between the forces are approximated by analytic functions. Offensive weapons are restricted to one type for each side. Defensive weapons are represented by a factor reducing the attacking forces on penetration and depenetration by a fractional multiple of their numbers. Test runs indicate the general validity of the model; however, to be useful it must include more detail and will require much more equipment. Specifically, the time delay approximations used were a compromise between the accuracy desired and the means available. The continuation of this work will be directed toward an analog-type model of unrestricted size and toward a smaller quick-response capability. It is felt that if these programs run in parallel, developments on one will aid the other. If an excessive amount of equipment is required to mechanize the unlimited model, then a digital computer may be used to perform the calculations. (Author)

AD-261 622 Div. 18, 15
(21 Aug 61) OTS price $2.60

Technical Operations, Inc., Washington, D. C.
WAR GAME EVALUATION METHODS,
by R. M. Keigher. July 60, 31p. incl. tables.
(Staff memo. no. 60-3)
(Contract AF 33(600)35190)
Unclassified report

DESCRIPTORS: *Games theory, *Programming, *Linear programming, Test methods, Matrix algebra, Warfare, Simulation, Mathematical prediction, Mathematical analysis.

Given an objective, it may be possible to design decision models. The ABM would be used as a prediction process and analytical techniques would be used as evaluation methods to process the predictions and provide information for the decision models. Linear programming techniques seem applicable as a war game evaluation method. The data arrangement required for the application of the mathematical programming is likely to yield some new information, even if the attempt to formulate the problem otherwise fails. (Author)

AD-261 850 Div. 18, 15
(24 Aug 61) OTS price $9.10

Operations Research Center, U. of Calif., Berkeley.
REDUCING LETTER DELAYS IN POST OFFICES,
by Robert M. Oliver and Aryeh H. Samuel.
14 July 61, 109p. incl. illus. tables (Research rept. no. 11; Rept. no. IER 172-12)
Unclassified report

DESCRIPTORS: *Operations research, *Processing, *Mathematical analysis, Distribution, Effectiveness, Equations, Distribution theory, Scheduling, Calculus of variations.

This paper reports a group of mathematical models and experiments which have been designed for the analysis and evaluation of delays of first-class letter mail in a post office. The flow pattern of mail consists of a number of serial and parallel processing stages. A letter takes a particular path through this flow network which depends on its final destination; consequently, the delay of letter mail depends on its address as well as the inventories of other mail and the processing rates met enroute. While mail flow into a post office may contain many random elements, it is generally the case that input rates are predictable and strongly time-dependent. Scheduling policies must take into account the peak flows which temporarily exceed available processing rates and, in addition, must observe certain specified restrictions on the cost of processing, sorting and storage operations. The effect of various transportation facilities between processing stages and from one post office to another must also be considered. This paper includes a theoretical and numerical analysis of letter delays as well as a description and evaluation of a series of full-scale experiments performed at one of the larger United States Post Offices. (Author)

AD-261 948 Div. 18, 12, 22
(28 Aug 61) OTS price $4.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
CONVENTIONAL AND GUIDED MISSILE AMMUNITION.
Quarterly maintenance engineering rept. 1 Apr-31 June 61,
by F. L. Sedlacek. 31 June 61, 47p. incl. tables.
(Rept. no. DC-QR: 4-61)
Unclassified report

DESCRIPTORS: *Ammunition, *Guided missiles, Supply depots, Catalogs, *Maintenance, Military procurement, *Logistics, Documentation, Handbooks, Storage, Packaging, Ordnance, Rockets, Rocket motors, Projectiles, Warheads, Guided missile warheads, Fuzes, Cartridges, Guns.

19. NAVIGATION

AD-261 607 Div. 19, 30
(21 Aug 61) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
INERTIAL COMPONENTS STUDY.
Final rept. 1 July 60-30 June 61,
by B. H. Evans. 30 June 61, 14p. 17 refs. (Rept. no. 7205-0002-RU-000)
(Contract AF 04(647)619)
(AFBSD TR 61-8) Unclassified report

DESCRIPTORS: *Inertial guidance, *Guided missiles, Surface to surface, Reliability, Tests, Test methods, Velocity, *Accelerometers, *Gyroscopes, Servo amplifiers, Centrifuges, *Test facilities, Guidance.

The evaluation of the Autonetics VM-4 velocity meter was completed; evaluations of the Autonetics G-6A gyro, the AC Spark Plug 25 PIGA accelerometer, the AC Spark Plug 2 FBG, and the AC Spark Plug 16 PIGA accelerometer were continued. The 16 PIGA evaluation included the first successful centrifuge evaluation of a pendulous gyro accelerometer. Studies of gyro and accelerometer testing methodology were continued. Evaluation of the Bell Accelerometer Model III-B and the Kearfott Gyro Model 2519 were concluded. (Author)

AD-262 009 Div. 19
(28 Aug 61) OTS price $7.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
DISTANCE MEASURING EQUIPMENT TACAN COVERAGE TESTS.

Final rept.,
by H. T. Darracott. Dec 60, 76p. incl. illus. tables.
Unclassified report

DESCRIPTORS: Calibration, Sensitivity, Flight testing, *Radio navigation, Navigation, *Radio equipment, Airborne, *Range finding.

Flight tests were made with a modified Distance Measuring Equipment TACAN Interrogator (AN/ARN-21) to simulate a General Aviation (Class II) type interrogator to determine whether this type of equipment with reduced output power (50 watt) and receiver sensitivity (-76 dbm) could give adequate and reliable coverage utilizing normal VORTAC facilities. Data indicate that coverage is adequate and reliable. (Author)

AD-262 010 Div. 19, 30, 33
(28 Aug 61) OTS price $5.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
SIMULATION TESTS OF DATA PROCESSING CENTRAL (DPC) MISSED-APPROACH AND TERMINAL AREA.
Final rept.
Sep 60, 51p. incl. illus. tables
(In cooperation with Franklin Inst. Labs.)
Unclassified report

DESCRIPTORS: *Data processing systems, *Air traffic, *Air traffic control systems, Display systems, Computers, Simulation, Test methods, Aircraft, Landing, Tests.

Test results indicated that the missed-approach display described in AMB-58-2 could be eliminated and its function absorbed by the missed-approach route display which indicates the status of unassigned arrival slots pictorially. However, additional information will be required by the controller if arrival slots are not available and delay at a missed-approach holding fix is anticipated. From an operational standpoint, it would appear more compatible with present procedures if the missed-approach display was relocated from the arrival to the departure plan position indicator radar scope. Controller opinion indicated that a single controller could not handle both departure and missed-approach aircraft with the volume of traffic simulated. During the initial course of the study, it was found that, if fixed time separation was a requirement (2 minutes was used to provide a minimum of 3 miles' separation), it would be better to have the point at which the aircraft were scheduled to pass at equal intervals to be on the localizer course rather than at touchdown. For the traffic sample used in simulation, the schedule point was 3 miles from touchdown or approximately at the Idlewild outer marker. (Author)

AD-262 012 Div. 19
(28 Aug 61) OTS price $2.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EXPERIMENTAL AIR TRAFFIC CONTROL RADAR BEACON INTERROGATOR RECEIVING EQUIPMENT, FAA/BRD TYPE 40212(X-1),
by R. R. Barkalow. Sep 60, 25p.
Unclassified report

DESCRIPTORS: *Radar beacons, *Air traffic control systems, Identification systems, Radar receivers, Coding, Plan position indicators, Flight testing, Position finding, Reliability, Lobing, Reduction, Tests, Acceptability.

Engineering acceptance tests of the experimental interrogator, type 40212(X-1) were conducted to determine the technical adequacies of the equipment ,to meet Federal Aviation Agency specifications of increased angular resolution and sidelobe suppression techniques. An ANDB 2.3NS1B beacon interrogator was modified to provide increased angular resolution of responding aircraft on the plan position indicator display of the Air Traffic Control Radar Beacon System. Flight tests conducted indicated that the feasibility of the center mark technique for increased angular accuracy could be useful in the beacon environment. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-261 503 Div. 20
(21 Aug 61) OTS price $2.60

Ordnance Tank-Automotive Command, Detroit, Mich.
GAMMA RAY CRYSTAL DOSIMETRY,
by Otto Renius and Donald Rees. Apr 61, 23p. incl. illus. table (Rept. no. RR-39)
Unclassified report

DESCRIPTORS: *Gamma rays, *Dosimeters, *Quartz crystals, Gamma counters, Radiation counters, Cesium, Radiation effects, Cobalt, Isotopes, X-rays.

BT cut quartz oscillator plates were subjected to Cesium 137 and Cobalt 60 gamma radiation up to total doses of 2,400,000 Roentgens. The radiation-caused frequency shifts of the quartz crystals were measured as functions of incident gamma ray energy, total radiation dose received, and dose rate. These data were used to investigate the feasibility of employing quartz crystal plates for high flux dosimetry measurements. The crystals were studied over a six month's period to note any recovery from radiation effects as measured by frequency shift. (Author)

AD-261 797 Div. 20
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFICIENCY OF A SYSTEM OF ABSORBING RODS IN A REACTOR WITH A REFLECTOR (Effektivnost' Sistemy Pogloshchayushchikh Sterzhney V Reaktore C Otrazhatelem),
by V. I. Nosov. 27 July 61, 15p. incl. illus. (Trans. no. MCL-968 of Atomnaya Energiya 9:262-269, 1960)
Unclassified report

DESCRIPTORS: *Control rods, *Reactor cores, *Thermal neutrons, Neutron flux density, Reflectors, Absorption, Multiplication factor, Reactor control, *Diffusion theory.

The criticality and distribution conditions of neutron fluxes for a homogeneous thermal-neutron reactor with a system of absorbing rods are obtained in a two-group approximation. The rods are submerged into the full depth of the reactor and are located at an equal distance from each other in a circle in the core or radial reflector. The results of the calculations are given. (Author)

Division 20 - NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-261 829 Div. 20
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE TAMING OF ATOMIC FIRE.
27 July 61, 4p. (Trans. no. MCL-1180 of Komsomol'skaya Pravda, 117 (11057), pp. 1-4, 19 May 61)
Unclassified report

DESCRIPTORS: *Nuclear physics, Nuclear reactions, *Atomic energy engineering, USSR, Control.

AD-261 855 Div. 20, 25
(22 Aug 61) OTS price $1.60

California U., Berkeley.
THE PARAMAGNETIC RESONANCE OF TRIVALENT Pm-147 IN LANTHANUM ETHYL SULFATE,
by H. J. Stapleton, C. D. Jeffries, and D. A. Shirley. July 61, 16p. incl. illus. table. 11 refs. (Technical rept. no. 8)
(Contract Nonr-22261, Proj. NR 017-723)
Unclassified report

DESCRIPTORS: *Promethium, Isotopes, Paramagnetic resonance, Absorption, Lanthanum compounds, Ethyl radicals, Sulfates, Single crystals, Rare earth elements, Radioactive isotopes, Nuclear magnetic moments.

Paramagnetic resonance absorption at 3-cm wavelengths is observed for trivalent Pm-147 in a single crystal of lanthanum ethyl sulfate at 4.2 K. The line shapes exhibit an asymmetry typical of non-Kramers doublets and become unobservable in a few days presumably due to broadening from radiation damage to the crystal. The experimental g-value is found to be in reasonable agreement with that predicted from crystal field theory. Effects from higher J level admixtures are taken into account in estimating the nuclear magnetic moment value (3.0 ± 0.3 nm.). (Author)

AD-261 857 Div. 20
(24 Aug 61) OTS price $13.00

General Dynamics/Fort Worth, Tex.
MATERIALS DATA FOR NUCLEAR SYSTEMS,
by W. Q. Hullings. 17 July 61, 183p. incl. illus. tables (Rept. no. FZK-131; Document no. NARF-61-24T; FZK-9-162)
(Contracts DA 23-072-ORD-1534 and AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Nuclear energy, Materials, Metals, Impurities, *Shielding, *Radiation hazards, Water, Air, Beryllium, Beryllium compounds, Physical properties, Aluminum alloys, Iron alloys, Boron alloys, Mechanical properties, Liquid metals, Plastics, Niobium, Niobium alloys, Steel, Rubber, *Heat resistant alloys, Graphite, Casting, *Heavy water reactors, Uranium, Uranium compounds, Uranium alloys, Lead, Lead alloys, Lithium alloys, Boron, Radioactive isotopes, Oxides, Carbides, Boron compounds, Borohydrides, Safety, Zirconium, Cryogenics, High temperature research, Gamma rays, Low temperature research.

A compilation has been made of significant inforion on the properties of engineering materials and their use in nuclear systems. The information is divided into three main parts: (1) shielding materials, (2) reactor materials, and (3) materials at extreme temperatures. The report is intended to serve as an aid to materials and design engineers engaged in the design, fabrication, and installation of nuclear systems. (Author)

AD-261 903 Div. 20
(24 Aug 61) OTS price $3.60

Uppsala U. (Sweden).
ANTIPROTON INTERACTION CROSS SECTIONS,
by A. G. Ekspong and B. E. Ronne. 1961, 32p. incl. illus. tables.
(Contract AF 61(052)13)
(AFOSR TN 59-412)
Unclassified report

DESCRIPTORS: *Antiprotons, *Photographic emulsions, Scattering, *Elastic scattering, Proton reactions, Annihilation reactions, Nucleons, Inelastic scattering, Nuclei, Sweden.

A study was made of 371 antiproton tracks in nuclear emulsions in the enregy region 250 - 0 Mev. A path length of 36.5 meters was followed. Ten new elastic P-P scattering events together with eleven events published earlier yield an elastic scattering cross section of 77 ± 17 mb. The total and the differential elastic cross sections are consistent with the theory by Chew and Ball. The mean free path for annihilation in the energy region 35 to 250 Mev is 19.4 ± 1.5 cm, and the inter-action mean free path is 17.4 ± 1.2 cm. An effective antiproton-nucleon cross section of 170, +30-25 mb was deduced from an optical model calculation. Six new inelastic scatterings are reported. Together with the 8 or 9 events published by Goldhaber et al. (Phys. Rev. 110:1474, 1958) one gets an inelastic scattering cross section of 43 ± 11 mb per emulsion nucleus (hydrogen excluded). The low value of the cross section is discussed in the light of the optical model. The elastic scattering on complex nuclei seems to agree with a completely absorbing nucleus. (Author)

AD-261 907 Div. 20, 25
(24 Aug 61) OTS price $8.10

Washington U., St. Louis, Mo.
A MEASUREMENT OF THE LONGITUDINAL POLARIZATION OF NEON-19 POSITRONS.
Doctoral thesis,
Jovan Jovanovic. Aug 61, 83p. incl. illus.
(Technical rept. no. 3)
(Contract AF 49(638)843)
(AFOSR-1099)
Unclassified report

DESCRIPTORS: *Polarization, *Neon, Isotopes, *Positrons, Annihilation reactions, Measurement, Bremsstrahlung, Helixes, Nuclear physics, Radioactive isotopes.

An experiment whose object is to measure the energy dependence of helicity of positrons emitted from Ne-19 is described. The positron helicity is measured indirectly by transferring it to the annihilation-in-flight photons, whose transmission through a magnetized iron cylinder is dependent on their polarisation. The positron

helicity therefore results in a difference of the counting rates for opposed directions of the magnetic field. The measured dependence of this asymmetry with pulseheight is compared with a computation which assumes the validity of the two component neutrino theory of beta decay and neglects the depolarisation of positrons. A good fit of theoretical curve to the experimental points is obtained for pulseheights larger than about 1.3 Mev. A strong disagreement is found in the pulseheight range between 0.75 and 1.0 Mev, where the experimental asymmetries are much lower than the prediction. The measurement of the asymmetry of bremsstrahlung produced in copper by electrons from a Sr-Y-90 source is used in order to measure the effective number of aligned electrons in the magnetised iron cylinder. (Author)

AD-261 933 Div. 20, 8
(28 Aug 61) OTS price $15.00

Boeing Co., Seattle, Wash.
TRANSIENT RADIATION EFFECTS ON ELECTRONICS. PART I. KUKLA TRANSIENT RADIATION TESTS.
Rept. for June-Sep 60 on Transient Radiation Effects to Electronic Systems,
by Richard L. Lander, Robin K. Durkee, and others.
Jan 61, 223p. incl. illus. tables (Document no. D2-7899)
(Contract AF 33(616)7531, Proj. no. 0(1-5237)
(WADD TN 61-8, pt. 1) Unclassified report

DESCRIPTORS: *Radiation damage, Electronic equipment, *Test facilities, Tests, Test methods, *Thryatrons, Electron tubes, Dielectrics, *Capacitors, *Diodes, Germanium, Semiconductors, Dosimeters, Transients, Electronic circuits, Radioactivity, Failure (Mechanics), Sparks.

Contents:
Kukla dosimetry
Transient effects in dielectrics and capacitors
Transient radiation induced spark gap breakdown in air
Transient radiation induced firing of 5643 thyratron
Transient effects in semiconductor diodes
Analysis of circuit and piece part test requirements for transient radiation effects testing
The kukla prompt critical facility

AD-261 974 Div. 20
(25 Aug 61) OTS price $2.60

Battelle Memorial Inst., Columbus, Ohio.
EXPERIMENTAL AND RESEARCH WORK IN NEUTRON DOSIMETRY.
Final summary rept. on Phase 2, 1 Mar-30 Apr 61,
by R. K. Crooks, H. C. Gerton and others.
31 May 61, 22p. incl. illus.
(Contract DA 36-039-sc-78924)
Unclassified report

DESCRIPTORS: *Dosimeters, *Neutron detectors, Fast neutrons, Measurement, Non-destructive testing, Radioactivity, Detectors, Calibration, Electronic circuits, Tests, Radiation instruments, Life expectancy.

The readout problem is discussed and the development is described of an engineering readout instrument which is an improvement over the earlier prototype model and provides an accurate means of making radiation measurements on the radiac detectors designated as DT-236 (XE-1)/PD. Consideration was given to the measurement of 2 parameters, carrier lifetime and forward resistance, both of which are functions of the total radiation exposure of the detector. The objective was to develop an engineering model of a readout device for measuring either lifetime or forward resistance. Tests indicated that the engineering model of the readout instrument developed is capable of measuring the forward voltage drop across the radiac detector to an accuracy of about + or - 5 per cent under room-temperature conditions. The radiation exposure of a given detector can therefore be determined from suitable voltage-radiation calibration curves for the detector type. (Author)

AD-261 975 Div. 20, 8
(29 Aug 61) OTS price $11.00

Chance Vought Aircraft, Dallas, Tex.
NUCLEAR RADIATION TOLERANT CIRCUITRY DESIGN AND TEST.
Rept. for July-Nov 60,
by J. R. Perkins and J. C. Mitchell. Mar 61,
142p. incl. illus. tables.
(Proj. 8222)
(WADD TR 61-112) Unclassified report

DESCRIPTORS: *Radiation tolerance, *Radiation damage, *Fast neutrons, *Electronic circuits, Tests, *Control systems, Aircraft, Research reactors, Materials, Radioactive decay, Electron tubes, Transistors, Radioactivation analysis.

Several typical electronic flight control circuits with nuclear radiation damage thresholds of 10 to the 14th power fast neutrons/sq cm were redesigned to withstand 10 to the 17th power fast neutrons/sq cm. These circuits were operated and monitored for 100 hours while subjected to nuclear radiation, with very little change noted in operating characteristics. Techniques used in hardening these electronic circuits to withstand the nuclear radiation environment and details of test results are presented. Analyzed data in the form of curves are given; and the effects of nuclear radiation on the electronic components and circuits tested, and photographs of the irradiated equipment are considered. (Author)

AD-262 054 Div. 20, 26
(30 Aug 61) OTS price $1.10

Nobel Inst. for Physics (Sweden).
RECENT WORK ON INSTRUMENTATION FOR NUCLEAR PULSE-HEIGHT SPECTROSCOPY. MANUFACTURING TECHNIQUES AND PERFORMANCE OF SURFACE BARRIER SEMICONDUCTOR DETECTORS,
by B. Astrom, N. G. E. Johansson, and Gunilla Wickenberg. 1 June 61, 6p. incl. illus. (Technical note no. 6)
(Contract AF 61(052)118)
(AFOSR-983) Unclassified report

Conference on Nuclear Electronics, Belgrade 1961, NE/87.

DESCRIPTORS: *Pulse height analyzers, Spectrographic analysis, Particles, *Semiconductors, Detectors, *Nuclear physics, Nuclear physics laboratories, Production, Processing, Sweden.

Division 20 - NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

The invention of the semiconductor detector for charged nuclear particles opened up new possibilities in the use of pulse-height spectroscopy techniques. At the Nobel Institute a wide range of applications of semiconductor detectors is foreseen. The various experiments demand different types of detectors which generally have a limited life time. In order to secure a sufficient supply of adequate units, production of surface barrier detectors was started at the institute. A description of the detectors and the production techniques employed is given. (Author)

AD-262 169 Div. 20, 10
(31 Aug 61) OTS price $13.00

Aerojet-General Nucleonics, San Ramon, Calif.
HYDRAZINE PROCESS DEVELOPMENT.
Interim technical engineering rept., Apr-July 61.
by J. H. Cusack, L. G. Carpenter, and others.
Aug 61, 184p. incl. illus. tables, 14 refs.
(Contract AF 33(600)42996, Proj. 7-840)
(ASD TR 7-840A, vol. 2) Unclassified report

DESCRIPTORS: *Hydrazines, Processing, Production, Nuclear energy, Chemical reactions, *Production reactors, Fission products, Design, Construction, Operation, Ammonia, Uranium compounds, Dioxides, Separation, Research reactors, Circular coils, Test facilities, Synthesis.

A program is being conducted for the development, design, construction and operation of a continuous in-reactor N2H4 production loop based on the fissio-chemical processing approach. The history, organization and detailed goals of the program are presented. Theoretical background, specific requirements and initial experimental approaches in the task areas of fuel separation, product concentration, gas disengagement, materials testing, in-reactor engineering and radiolysis mechanisms are discussed. Multiple hydroclones in series will provide the first approach to the continuous separation of 40 g/l of 1 to 3 micron UO2 particles from liquid NH3. A back-up method involving a high-boiling organic additive is also under study. Ultra-sonic energy was found to promote coalescense of small gas bubbles enabling successful gas-liquid separation. Preliminary conceptual layouts of the loop and supporting equipment were completed; design and control approaches were established. Theoretical ranges of fission fragments in UO2 and in NH3 were computer calculated. (Author)

AD-262 181 Div. 20
(29 Aug 61) OTS price $7.60

General Dynamics/Fort Worth, Tex.
MONTE CARLO AIR-SCATTERING DATA FOR MONO-ENERGETIC FAST NEUTRONS FROM POINT ISOTROPIC SOURCES.
by C. A. Diffey. 15 Aug 61, 80p. incl. tables.
(Doc. no. NARF-61-29T; rept. no. MR-N-284)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Fast neutrons, *Diffusion, Neutron flux density, *Numerical methods and procedures, Tables, Air, Scattering.

The Monte Carlo fast-neutron air-scattering data were integrated to obtain the angular distributions and energy spectra for a point isotropic source emitting one neutron per second at a given energy E sub o. These calculations were performed for source-detector separations of 10, 35, 64, and 100 feet and for initial neutron energies of 0.33, 1.1, 2.7, 4.0, 6.0, 8.0, 10.9, and 14.0 mev. (Author)

AD-262 190 Div. 20
(30 Aug 61) OTS price $1.60

Nobel Inst. for Physics (Sweden).
INVESTIGATION OF GAMMA RADIATION FROM NUCLEAR REACTIONS.
Final rept., 1 Jan-31 Dec 60,
by K. G. Malmfors. 14 Mar 61, 10p. incl. illus.
(Contract AF 61(052)336)
(AFOSR-539) Unclassified report

DESCRIPTORS: Nuclear physics, *Gamma rays, *Gamma ray spectrometers, Proton reactions, Proton scattering, Inelastic scattering, Targets.

Gamma radiation from nuclear reactions was studied by means of a time-of-flight spectrometer (trochoid spectrometer). The spectrometer was used in connection with an 80-cm cyclotron. The reaction F-19 (proton, alpha particle) O-16 was studied. A thick target of CaF2 was bombarded with 3.5 mev protons and the resulting gamma radiation was allowed to fall upon a converter at a distance of 5 cm from the target. First an aluminum converter was used and the Compton electrons were analyzed according to the flight time in the spectrometer. Electronic equipment was later constructed which made it possible to use the instrument as a pair spectrometer. In this case a gold converter was used and the flight times of the positrons and the negatrons were recorded and combined so that a gamma spectrum could be immediately obtained on a 100-channel pulse-height analyzer. Results of such measurements are shown in fig. 5. In accordance with the well-known level scheme of O-16 three gamma lines with the energies 6.14, 6.92 and 7.12 mev are observed. These values are taken from the literature and the measurements reported should be considerered as a calibration of the spectrometer. (Author)

AD-262 211 Div. 20
(1 Sep 61) OTS price $9.10

Armour Research Foundation, Chicago, Ill.
RADIATION STREAMING IN SHELTER ENTRANCEWAYS.
Final rept. Oct 60-June 61,
by C. W. Terrell and A. J. Jerri, July 61, 99p. incl. illus. tables (Rept. no. ARF 1158A01-5)
(Contract NBy-3185)
Unclassified report

DESCRIPTORS: Protective coverings, *Shelters, Ducts, Ventilation ducts, Albedo, Theory, *Gamma emission, *Neutrons, Measurement, Neutron flux density, Attenuation, Neutron counters, Concrete, Lead, Gamma rays, Calibration, Gamma counters, Neutron detectors, Mathematical analysis.

The objective of this program is an analytical and experimental investigation of nuclear radiation streaming in ducts and shelter entranceways. The energy dependence of duct attenuation was extended for gamma rays. Further duct geometry dependence was also measured. Thermal neutron attenuation was determined for a non-point source and the neutron attenuation was found to be extremely small. Use of albedo theory to successfully describe the radiation streaming of gamma rays was further strengthened and a computer code was prepared to describe the streaming in a straight duct. The code will represent a tremendous labor saving device for future calculations. An analytical analysis of a straight duct, using albedo theory, is included in the appendix along with an outline of future research needs. (Author)

AD-262 213 Div. 20
(1 Sep 61) OTS price $8.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
FAST REACTOR DESIGN. A BIBLIOGRAPHY,
comp. by Tibor Vincze. Aug 61, 92p. (Technical rept. no. 61-3)
Unclassified report

DESCRIPTORS: *Bibliography, *Fast reactors, Design.

Literature dealing with fast reactors of interest to nuclear engineers, scientists, and students is presented. The bibliography covers reports, magazine articles, books, U. S. and British patents, and conferences published from 1945 to 1960. Entries of REPORTS and PERIODICALS are arranged chronologically, and within the chronological sections the arrangement is alphabetical by title. The other sections have been arranged by title. Author and subject indexes are provided for greater convenience. (Author)

21. NUCLEAR PROPULSION

No Entries

22. ORDNANCE

AD-261 509 Div. 22
(21 Aug 61) OTS price $2.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
THE PREVENTION OF STRAY VOLTAGE IN ELECTRO-EXPLOSIVE CIRCUITS,
by Glenn R. Linsenmayer. July 61, 19p. incl. illus. 10 refs. (Rept. no. AFSWC TN 61-24)
Unclassified report

DESCRIPTORS: *Electric detonators, *Explosive actuators, Circuits, Voltage, Electric discharges, Radiofrequency, Rockets, Electrical conductance, Arming devices, Guided missile fuzes, Electric primers, Airborne, Inductance, *Detonation.

A number of incidents have occurred involving the inadvertent actuation of electro-explosive devices, in various armament systems, by various sources of stray voltage. Some methods of circuit design and testing, which may be used to prevent such actuations are summarized. A number of steps which will contribute to the prevention of dangerous conditions caused by activation of an EED by stray voltage, are: (1) prevent stray voltage from reaching the EED; (2) mechanically lock the explosive system so that even if the EED's are fired a dangerous condition cannot occur; (3) decrease the response of the EED's to stray voltage; and (4) check the EED firing circuit for stray voltages. (Author)

AD-261 676 Div. 22
(22 Aug 61) OTS price $3.60

Lake City Arsenal, Independence, Mo.
PRODUCT ENGINEERING DESIGN STUDY OF CARTRIDGE, 37MM, SPOTTING, XM415,
by Frank W. Littleford and George E. Ruppel. July 61, 41p. incl. illus. (IED rept. no. 61-12)
(Proj. 4010.15.0106.1.01.62)
Unclassified report

DESCRIPTORS: *Projectiles, Cartridge cases, *Spotting rounds, Design, *Cartridges.

The product engineering design study of Cartridge, 37mm, spotting, XM415, which is a sub-caliber component of the XM29 Weapons System is reported. Experience gained at Lake City Arsenal in the production engineering and initial manufacturing phase of Cartridge, 20mm, spotting, XM101, was fully utilized and applied. Twenty-one completely dimensioned and annotated component drawings were generated, but no actual metal parts were made or tested. The modified cartridge case is similar in basic design to the 20mm XM154. Two case plugs of different internal volume fit the case body to provide the two ranges required of the spotter round. The case wall thickness is the minimum which will safely withstand anticipated excess chamber pressure requirements without additional heat-treatment. The projectile was simplified and improved by changing to a conventional one-piece body with a male threaded fuze intruding into the mouth. Several internal changes were made for simplification of manufacture, assembly, or both, and several components were eliminated thereby. The counterweight was changed from lead to D-38 which was a major factor in the increase of the payload by 23% over the Picatinny Arsenal projectile. (Author)

AD-261 677 Div. 22
(22 Aug 61) OTS price $1.60

Lake City Arsenal, Independence, Mo.
MODIFICATION OF FUZE TO PREVENT PREMATURE ACTION,
by James B. Hendon. Apr 61, 14p. incl. illus. tables (IED rept. no. 61-5)
(Proj. OAC 56-142)
Unclassified report

DESCRIPTORS: *Point detonating fuzes, *Firing mechanisms, High explosive ammunition, Projectiles, Tests, Reliability, Acceptability.

The work conducted by Lake City Arsenal to eliminate those premature functions of the 20mm Fuze, PD, M505 due to loss of the fuze cover is reported. Investigatory tests verified that premature functioning was related to loss of the fuze cover during flight; air impingement driving the firing pin into the detonator. The firing pin was modified by addition of a shear flange around the head which prevented rearward movement except upon impact with a solid object. Minor modifications were also made to the fuze firing pin guide hole. Ballistic firing tests of the M505 Fuze with various firing pin flange thicknesses, were conducted against aluminum alloy plate of various thicknesses set at different obliquities and ranges to determine functioning sensitivity. Ballistic tests indicated that prematures due to loss of the fuze covers had been eliminated. (Author)

AD-261 781 Div. 22, 4
(22 Aug 61) OTS price $16.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE CHEMISTRY AND TECHNOLOGY OF HIGH EXPLOSIVES, PART I (Khimiya I Tekhnologiya Brizantnykh Vzryvchatykh Veshchestv),
by Ye. Yu. Orlova. 23 June 61, 251p. incl. illus. tables (Trans. no. MCL-844, pt 1, of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo, Moscow, 397p., 1960)
Unclassified report

DESCRIPTORS: *Explosives, Production, Chemical properties, Physical properties, Manufacturing methods, Chemicals, Nitro radicals, Amines, Esters, Nitration, Chemical reactions, Theory, Acids, Organic compounds, Synthesis, USSR, Reaction kinetics, Textbooks, Chemical engineering.

Data on the properties and methods of production of high explosives is systematically presented in book form. The theoretical principles of the production processes are examined, and the states of the high-explosives industry abroad is described on the basis of literature data. The book consists of 3 parts embracing the 3 most important classes of explosives: (1) nitro compounds; (2) nitroamines; and (3) nitric esters. In the first chapter of each part, the general properties of the explosives of the given class are illuminated, as are the theoretical fundamentals of the process by which they are produced. A description is then given of the chemistry and technology of the most important representatives of this class. In addition, the first part includes a description of the kinetics of the process of nitration in homogeneous and heterogeneous conditions as well as the nitration process flow, and the acid equipment of the high-explosives plant.

AD-261 782 Div. 22, 4
(22 Aug 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE CHEMISTRY AND TECHNOLOGY OF HIGH EXPLOSIVES, PART II,
by Ye. Yu. Orlova. 23 June 61, 567p. incl. illus. tables (Trans. no. MCL-844, pt. 2, of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo, Moscow, pp. 252-567, 1960)
Unclassified report

DESCRIPTORS: *Explosives, Production, Chemical properties, Physical properties, Manufacturing methods, Chemicals, Nitro radicals, Amines, Esters, Nitration, Chemical reactions, Theory, Acids, Organic compounds, Synthesis, USSR, Reaction kinetics, Textbooks, Chemical engineering.

AD-261 783 Div. 22, 4
(22 Aug 61) OTS price $13.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE CHEMISTRY AND TECHNOLOGY OF HIGH EXPLOSIVES, PART III,
by Ye. Yu. Orlova. 23 June 61, 184p. incl. illus. tables, 669 refs. (Trans. no. MCL-844, pt. 3 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo, Moscow, pp. 252-567, 1960)
Unclassified report

DESCRIPTORS: *Explosives, Production, Chemical properties, Physical properties, Manufacturing methods, Chemicals, Nitro radicals, Amines, Esters, Nitration, Chemical reactions, Theory, Acids, Organic compounds, Synthesis, USSR, Reaction kinetics, Textbooks, Chemical engineering.

AD-261 837 Div. 22, 30
(23 Aug 61) OTS price $1.60

Belock Instrument Corp., College Point, N. Y.
ANGLE OF SITE FEASIBILITY STUDY,
Final engineering rept.,
by J. Panatier. Aug 61, 21p. incl. illus.
(Contract DA 30-069-ORD-3114)
Unclassified report

DESCRIPTORS: *Fire control computers, Fire control, *Tanks, Data processing systems, Range finding, Periscopic gun sights, Self-propelled guns, Errors, *Projectile trajectories, Reduction, Height finding, Surface targets, Equations.

Investigations were made to determine the extent of finding angle errors for one of the important future ammunitions to be used with the 105mm gun tube in the M60 tank and a typical ammunition used with the 90mm gun tube in the M48 tank. It was concluded that: (1) correction for the error due to neglect of angle of site is feasible, and a correction equation can be formulated to accomodate most ammunitions, (2) instrumentation of this correction can be made simply and for a comparatively small cost. and (3) inasmuch as the XM16 computer was designed to perform with an over-all accuracy 0.2 mil, optimum operation can never be attained unless some correction is made for the angle of site error. (Author)

AD-261 958 Div. 22, 26, 13, 30
(28 Aug 61) OTS price $9.60

Armour Research Foundation, Chicago, Ill.
TESTS ON ATLAS BLAST VALVES.
Final test rept. no. 20 (Preliminary) on Blast Effects on Buildings and Structures and Protective Construction Operation of Six-foot and Two-foot Shock Tubes,
by James J. Swatosh, Jr., 30 Apr 61, 112p. incl. illus. tables.
(Contract AF 29(601)796, Proj. 1080)
(AFSWC TN 61-16) Unclassified report

DESCRIPTORS: *Underground structures, *Shock tubes, *Air blast, *Blast, Seals, *Valves, Nuclear explosions, Atomic bomb explosions, Pressure vessels, Loading, Shock waves, *High pressure valves, Hydraulic systems, Pistons, Plastic seals, High temperature research, Low temperature research, Test facilities, Tests, Failure (Mechanics).

The WS-107A-1 Silo Blast Closures, 16- and 42-in. were subjected to a series of performance experiments. These performance experiments were designed to simulate the actual operating conditions and/or environments to which the closures would be subjected during normal operation. The 16-in. closures reacted satisfactorily to all the performance experiments with the exception of cold environments. They were subjected to maximum test blast load without failure. During the cold environment experiments, pressure leaks in the hydraulic system of the closures developed at approximately 0 F. These pressure leaks resulted from the shrinkage of the teflon seals in the system. The 42-in. closures responded satisfactorily only to the hot environment experiments. The temperature of the 42-in. closures was raised to 300 F before any failures occurred. Pressure leaks in the hydraulic system occurred when the closures were air-blast loaded. Extensive damage developed during repeated cycling experiments. (Author)

AD-261 998 Div. 22, 25, 7, 14
(25 Aug 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
THE DYNAMIC HYSTERESIS CURVE OF POLARIZED BARIUM TITANATE ELEMENTS,
by R. H. Wittekindt. 25 July 61, 21p. (DOFL rept. no. TR-963)
(Proj. 30300)
Unclassified report

DESCRIPTORS: *Dielectrics, *Barium compounds, *Titanates, Dielectric properties, Impact shock, Polarization, Electric fields, Electrodes, Ceramic materials, Ceramic capacitors, Capacitors, Hysteresis, Ferroelectric materials, Piezoelectric materials.

The dynamic hysteresis curve of polarized barium titanate elements has been measured in its second quadrant. This is the part of the hysteresis curve D = D(E) which goes from E = 0, D = P sub o to E = E sub c, D = 0, whereby the negative field -E increases from zero to E sub c within fractions of a microsecond. This part of the hysteresis curve is needed for calculations in connection with shock compression experiments on the barium titanate elements. (Author)

AD-262 019 Div. 22
(28 Aug 61) OTS price $2.60

General Technology Corp., Elgin, Ill.
PROCEDURE FOR DEVELOPMENT OF A DIGITAL COMPUTER PROGRAM FOR FLAT BASE SHELL ANALYSIS.
Rept. on R search and Development Study on Stress-Strain Characteristics of Shells and High Explosives,
by R. C. Geldmacher and T. M. Roach, Jr. June 61, 20p. incl. illus. (Technical rept. no. 1-17)
(Contract DA 11-022-ORD-2917, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: *Digital computers, *Projectiles, High explosive ammunition, Cylindrical bodies, Design, Stresses, Mathematical analysis, Elasticity, *Programming, Theory, Deformation, Differential equations, Cartridge cases, Projectile cases.

An analysis of empty flat base shells and filled flat base shells, along with the simplified computational procedures, has been unified and condensed to give a step by step procedure for developing a digital computer program for calculating the displacement and stress in banded flat base shells. The simplified procedures necessary, if desk calculation of stresses are to be made, are included as an intermediate step in the calculation procedure for the more general case requiring the use of digital computation. The analysis from which the material is drawn, is developed from small deformation elastic theory and is applicable to shell designs where stresses will be below the elastic limit of the shell material. By means of the digital computer program prepared from the material presented here, one may obtain for his design a complete analysis of displacement and stress simply by presenting the geometry, loading, and material properties of his shell to the digital computer center. (Author)

AD-262 074 Div. 22
(29 Aug 61) OTS price $1.60

Picatinny Arsenal, Dover, N. J.
COMPATIBILITY OF PROPELLANT GRAIN DIMENSIONS AND CHARGE WEIGHT TOLERANCES WITH AUTOMATIC WEIGHING AND LOADING OF CANNON PROPELLANT,
by A. Stanfield. July 61, 16p. incl. table (Technical rept. no. ND4-TR3)
(Proj. OAC 904-17)
Unclassified report

DESCRIPTORS: *Propellants, *Propelling charges, Loading, Configuration, Specifications, Statistical analysis, Automatic, Ballistics, Propellant grains, Automation.

The effect of charge weight tolerances on ballistic dispersion of complete rounds was investigated in order to determine the extent to which the charge weight tolerances might be relaxed to facilitate propellant weighings and loadings by automatic machinery. Relaxed charge weight tolerances were incorporated in nine specifications after it was determined that adverse effects on variations in pressure or velocity would not result. Propellant grain geometry was also analyzed. The investigation included statistical analyses of propellant grain straightness, length, and web dimensions. Results indicated that a partial relaxation of charge weight tolerances can be accomplished without jeopardizing ballistic quality of complete rounds. A minimum relaxation of charge weight tolerances to ± 0.25 ounces is considered

appropriate for a number of complete rounds, with the reservation that further relaxation be accomplished only if and when actual machine charge weight tolerance requirements become known for specific items. (Author)

AD-262 201 Div. 22, 23, 14, 26
(30 Aug 61) OTS price $.75

Watertown Arsenal Labs., Mass.
UTILIZATION OF PLASTICS TO FABRICATE XM28 AND XM29 TRAINING AIDS.
Rept. on Local Training Aids and Devices, by Arthur M. Ayvazian. July 61, 24p. incl. illus. (Rept. no. WAL TR 280.9/1)
Unclassified report

DESCRIPTORS: *Training devices, *Plastics, Resins, Epoxy resins, Acrylic resins, Laminates, Thermosetting resins, Glass textiles, Manufacturing methods, Plastic tubing, Molding materials, Molding, Materials, Rocket launchers.

An investigation was made to develop a capability to use plastics for fabricating training devices. Five full-scale training aids for each design, XM28 and XM29, were successfully fabricated. The aids were constructed from plastic resins and material, such as epoxy resin castings, plexiglas components and nylon gears. In the process of manufacturing these devices, an invaluable capability was developed for future applications requiring the employment of plastic materials. The selected plastics proved to be satisfactory material for the fabrication of the training devices. With proper handling, the performance of these aids should be adequate. (Author)

AD-262 249 Div. 22, 1
(1 Sep 61) OTS price $6.60

Frankford Arsenal, Philadelphia, Pa.
SUPPORT OF F103 CAPSULE SLED TEST PROGRAM. (DEVELOPMENT OF CATAPULT, AIRCRAFT CAPSULE EJECTION, XM17 AND THRUSTER, PROPELLANT ACTUATED, T24), by G. H. Skopp. May 61, 62p. incl. illus. tables (Rept. no. R-1588)
(Contract AF 33(600)60-132, Proj. 1362)
(WADD TR 61-19) Unclassified report

DESCRIPTORS: *Explosive actuators, Jettisonable cockpits, *Release mechanisms, *Cartridges, Stresses, Mathematical analysis, Tests, Design, Specifications, Jettisonable equipment.

This report documents the modification of the T16 catapult, which was designated Catapult, Aircraft Capsule Ejection, XM17 and the development of the Thruster, Propellant Actuated, T24. Both devices were used in sled tests for the F103 capsule emergency escape system. Two XM17 catapults power the capsule during ejection, and the T24 thruster is used to deploy the main chute in an emergency if the drogue chute fails to operate. Although the T24 thruster was intended originally for use in the F103 emergency escape capsule, it was finally developed for a limited number of sled tests only. In performance tests, the thruster proved acceptable. It did not undergo environmental or qualification tests. The XM17 catapult met the specified requirements for the sled tests also. No environmental or qualification tests were performed. (Author)

23. PERSONNEL AND TRAINING

AD-262 127 Div. 23, 28
(28 Aug 61) OTS price $5.60

Human Resources Research Office, George Washington U., Washington, D. C.
WHAT HumRRO IS DOING.
Aug 61, 57p. incl. illus. (HumRRO research bulletin no. 8)
(Contract DA 44-109-qm-650)
Unclassified report

DESCRIPTORS: *Training, *Military training, *Military personnel, Training devices, Combat, Simulation, Military equipment, Officer personnel, Leadership, Maintenance, Maintenance personnel, Job analysis.

Contents:
HumRRO's First Ten Years, by Dr. Meredith P. Crawford
Training Potential Noncommissioned Officers-Task NCO, by Dr. Paul D. Hood
The Air Defense Missileman-Task VIGIL, by Dr. Robert D. Baldwin
Individual Training for Infantry-Task RIFLEMAN, by Dr. Thomas F. Nichols
Vehicle Maintenance Proficiency-Task MOBILITY, by Dr. John P. Smith
The Recruit Enters the Army-Task CAREER, by Dr. Richard Snyder
Integrating Contact-Instrument Training for Pilots-Task INTACT, by Dr. Wallace W. Prophet
Future Electronics Maintenance-Task FORECAST, by Dr. Edgar L. Shriver
Junior Officer Training-Task OFFTRAIN, by Dr. T. Owen Jacobs
Automated Foreign Language Instruction-Task CONTACT, by Dr. Eugene H. Rocklyn
Tank Unit Training-Task UNIT, by Dr. Robert A. Baker
Training the Aerial Observer-Task OBSERVE, by Dr. Francis H. Thomas
Air Defense Maintenance Training-Task MAINTRAIN, by Dr. James P. Rogers

AD-262 212 Div. 23, 18, 30, 15
(1 Sep 61) OTS price $11.00

American Inst. for Research, Washington, D. C.
OPERATIONAL ANALYSES OF THE NAVAL PERSONNEL SYSTEM. PART II. DEVELOPMENT AND TESTING OF A MACHINE SIMULATION OF PERSONNEL OPERATIONS, by Richard H. Gaylord and Wallace J. Knetz. July 61, 144p. incl. illus. tables (Rept. no. AIR-C3-60-FR-232)
(Contract Nonr-287200)
Unclassified report

DESCRIPTORS: *Operations research, *Naval personnel, *Military organizations, *Naval mobilization, Mathematical analysis, *Naval administration, Computers, Specifications, *Digital computers, Programming, *Military training, Effectiveness, Recruiting.

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-262 000 Div. 24
(28 Aug 61) OTS price $3.60

Reconnaissance Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
THE INFLUENCE OF SUPERSONIC AIRFLOW ON AERIAL PHOTOGRAPHY,
by Hermann R. Mestwerdt and Werner Rambauske. June 61, 34p. incl. illus. tables (In cooperation with Dayton U., Ohio)
(Proj. no. 6220)
(ASD TN 61-35) Unclassified report

DESCRIPTORS: *Aerial photography, *Supersonic flow, *Turbulent boundary layer, *Supersonic aerial photography, Atmospheric refraction, Effectiveness, Supersonic wind tunnels, Aerial cameras, Tests, Tables.

The influence of a turbulent boundary layer, as it affects refraction, dispersion, and scattering of light rays, was investigated as one of the phenomena that degrades photographic resolution. The investigation was experimental and consisted of making photographs of a resolution target through a supersonic wind tunnel with a high resolution camera (35mm film, f equals 135mm, 1:2.8). Short-duration flash or long-exposure incandescent illumination was used and photographs were made when the wind tunnel was operating and when not operating. Under experimental test conditions the system gave an average resolution of 380 lines/mm when the tunnel was not running and gave an average resolution of 302 lines/mm when the tunnel was operated with speeds of Mach 1.5, 2.0, and 2.5 and pressures corresponding to 30,000 ft and 50,000 ft altitude. The loss in resolution of approximately 80 lines/mm corresponds to a stochastic influence of a boundary layer of about 1/3-inch thickness on light scattering and as if produced through a medium with an inherent resolution limit of 1500 lines/mm. The results are in fair agreement with NACA results. It was concluded that photographic systems with a resolution up to 100 lines/mm and usual aperture ratios may not be disturbed greatly by a thin turbulent boundary layer. (Author)

AD-262 044 Div. 24, 19, 12
(28 Aug 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
AUTOMATIC FIXED-CAMERA ORIENTATION PROCEDURES,
by C. L. Bannister. Aug 61, 52p. incl illus.
(Technical note no. D-607)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical noteD-607.

DESCRIPTORS: Cameras, *Astronomical cameras, Calibration, Photetheodolites, Automatic, Photographic plates, *Computers, Ballistic cameras, Measurement, Least squares method, Photographic equipment, Control, Electronics, Night photography, Simulation, Programming, Matrix algebra, Position finding, *Guided missiles, Satellite vehicles, Celestial navigation.

Spatial triangulation employing two or more fixed cameras which record the same flash event is used to determine the precise position of a vehicle or missile-borne flash. The triangulation procedure requires that the position and calibration of the cameras used must be accurately known. An accurate position may be found by survey. The cameras are fixed phototheodolites with electronic shutter control. Since they are employed at night, the star backgrounds recorded on the camera plates provide an excellent means of obtaining precise analytical calibrations by a method known as star calibration. The formulas for this method calibration as programed for the I.B.M. 7090 computer are presented. Briefly, the program uses the camera dial settings, the times of the exposures, and the measurements of the star images on the plate to identify the stars automatically and execute a least squares solution to obtain an essentially error-free camera orientation calibration. (Author)

AD-262 171 Div. 24
(30 Aug 61) OTS price $10.50

Fairchild Camera and Instrument Corp., Syosset, N. Y.
RESEARCH AND DEVELOPMENT OF A HIGH ACUITY SHUTTER DESIGN.
Final rept.,
by F. Angelillo and W. Herbstreit. 4 Aug 61, 146p. incl. illus. tables (Rept. no. SME-AB-23)
(Contract AF 33(616)6476, Proj. 9(76-6220))
Unclassified report

DESCRIPTORS: *Camera shutters, *Aerial cameras, Vibration, Kinetic theory, Gas discharges, Thrust, Rotor blades, Jets, Orifices, High speed cameras, Reliability, Design.

An unusual concept for a high acuity shutter design is presented. There are two experimental models; both apply the theory of the kinetic energy of an expanding gas to move the shutter blades. Vibration was reduced to near zero, as a design concept, by having each reactive force in the system balanced by an equal and opposite force. This reaction cancellation technique is applicable to all forces present when operating the shutter blade. Model I demonstrates the principle of positive displacement. The shutter blade moves as a linear bi-directional piston. The operation of Model II can be described as a modified linear turbine. Motion is realized when impacting jets are directed at the inclined vane surfaces of the shutter blade. (Author)

25. PHYSICS

AD-261 506 Div. 25
(21 Aug 61) OTS price $2.60

Stanford U., Calif.
PARAMAGNETIC RESONANCE.
Technical repts.,
by R. H. Webb, M. E. Anderson, and others.
1 June 61, 24p. incl. illus. table.
(Contract AF 18(603)131)
Unclassified report

DESCRIPTORS: *Paramagnetic resonance, Polarization, Protons, Ferromagnetism, Nuclei, Electrons, Magnetic fields, *Free radicals, *Phenyl radicals, *Nuclear magnetic resonance, Organic compounds, Electron transitions, Cryogenics, Forbidden transitions, Allowed beta transitions.

This report includes:
Stanford U., Calif.
DYNAMIC POLARIZATION ANOMALIES IN ORGANIC FREE RADICALS, by R. H. Webb. 1 June 61, 4p. (Technical note no. 131-12)
(Contract AF 18(603)131)
(AFOSR-725)
Stanford U., Calif.
PROTON RESONANCE SHIFTS AND ELECTRON SUSCEPTIBILITIES IN 1,3-BISDIPHENYLENE 2-PHENYL ALLYL, by M. E. Anderson, R. S. Rhodes, and G. E. Pake. Sep 61, 4p. incl. illus. (Technical note no. 131-13)
(Contract AF 18(603)131)
(AFOSR-929)

Stanford U., Calif.
ANTIFERROMAGNETIC TO FERROMAGNETIC TRANSITIONS IN ORGANIC FREE RADICALS, by A. S. Edelstein and M. Mandel. July 61, 2p. incl. table (Technical note no. 131-15)
(Contract AF 18(603)131)
(AFOSR-1076)

AD-261 514 Div. 25
(21 Aug 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
THEORETICAL AND EXPERIMENTAL STUDIES CONCERNING RADIATION DAMAGE IN SELECTED COMPOUND SEMICONDUCTORS.
Interim progress rept. no. 2, 15 May-15 Aug 61,
by L. W. Aukerman, E. M. Baroody, and R. D. Graft.
15 Aug 61, 14p. incl. table, 13 refs.
(Contract AF 33(616)8064)
Unclassified report

DESCRIPTORS: *Radiation damage, *Semiconductors, Theory, Gallium compounds, Arsenides, Electron bombardment, Electrical properties, Optics, Kinetic theory, Neutron bombardment, Impurities, Absorption, Scattering, Transport properties, Mathematical analysis, Tests.

The defects introduced in n-type GaAs by irradiation at room temperature with energetic electrons anneal out in a manner which can be described in terms of two first-order processes. The first of these processes appears to be independent of the various extrinsic properties of the many specimens studied. The rate constant for the second process is proportional to the carrier density. This suggests that the mobility of the defects which anneal during the second process is influenced by the position of the Fermi level; consequently the results are analyzed under this assumption. The annealing of two p-type GaAs specimens after electron irradiation shows three rather distinct stages of annealing. The results from one specimen suggest that first-order annealing kinetics is not obeyed in the p-type samples. The defects introduced by fast neutrons are known to be somewhat more complex than those introduced by electron irradiation. The optical properties of fast-neutron irradiated GaAs suggest that small regions of a different phase may be produced. Calculations on scattering by repulsive potentials were extended to provide analytical expressions for the differential cross section which are good approximations over a wide range of angles. (Author)

AD-261 517 Div. 25, 30
(21 Aug 61) OTS price $3.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PLASMA STUDIES IN A SHOCK TUBE,
by John W. Daiber and Herbert S. Glick. July 61,
36p. incl. illus. tables, 39 refs. (Rept. no. AF-1441-A-4)
(Contract AF 30(602)2267)
(RADC TN 61-130) Unclassified report

DESCRIPTORS: *Plasma physics, *Shock waves, Shock tubes, Electrons, *Magnetohydrodynamics, Gases, Fluid mechanics, *Microwaves, Polarization, Reflections, Measurement, Electromagnetic wave reflections, Air.

Air plasmas produced by shock waves were studied in the temperature range extending from 3000 K to 5000 K at densities ranging from 0.005 to 0.015 that of standard air density. Microwave reflection measurements from these plasmas have been made at frequencies of 3320 and 9375 mc. A major aim of the reflection measurements was to determine whether or not polarization forces on the electron are important. The present results indicate that the Sellmeier theory, in which the polarization forces are assumed to be negligible, is the proper theory for relating electron concentrations and cross sections with macroscopic electrical parameters. In addition, the collision frequencies of electrons in air were found to agree closely with those reported by Lamb and Lin. The data also provided an estimate of the relaxation time for electron formation. (Author)

AD-261 518 Div. 25
(21 Aug 61) OTS price $1.10

Carborundum Co., Niagara Falls, N. Y.
A STUDY OF FUNDAMENTAL MECHANICAL PROPERTIES OF CERAMIC SINGLE CRYSTALS.
Bi-monthly rept. no. 1, 12 May-11 July 61,
by H. Dean Batha and Richard M. Drake.
27 July 61, 4p. incl. table.
(Contract NOw 61-0676-c)
Unclassified report

DESCRIPTORS: *Ceramic materials, *Silicon compounds, *Carbides, Boron, Chemical impurities, Crystals, *Single crystals, Solids, Solutions, Mechanical properties, Temperature, High temperature research, Crystal structure, Lattices.

The preparation and growth of crystals of SiC in solid solution with B is well advanced. Up to about 4.5wt-% B will go into solid solution with SiC. The amount of B present in the SiC is independent of the initial form of the B. B has been added to SiC, prior to heating, in the form of BN, B4C, B2O3 and elemental B. In each case, the limit of 4.5% B was not exceeded. Nitrogen analyses indicate a variation in N content from experiment to experiment, but no correlation can be made between B content and N content. (Author)

AD-261 519 Div. 25
(21 Aug 61) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
ATMOSPHERIC BREAKDOWN,
by R. Akerib and K. A. Brueckner. 30 June 61, 22p. incl. illus. (Rept. no. ZPh-106, App. 1)
(Contract AF 49(638)855)

Unclassified report

DESCRIPTORS: *Microwaves, Electromagnetic waves, *Propagation, Dielectric properties, *Atmosphere, *Electric discharges, Electrons, Density, Ionization.

The propagation of a microwave beam of high energy through the atmosphere is treated in connection with the problem of the breakdown of the atmosphere. A density of a few electrons is first considered. Under the influence of the field, these electrons are accelerated and, in colliding with the various atoms, pick up sufficient energy to undergo an ionizing collision with an atom. This process continues until the density of electrons is sufficiently high to reflect the microwave beam. Ionization is thus the basic process of the buildup of density of electrons. The story, however, is not so simple. A number of electron loss mechanisms are present; e.g. diffusion, attachment, and recombination processes. These processes are not all important simultaneously. In Section II, a simple theory of breakdown is described which is applied to attachment-controlled, diffusion-controlled breakdown. Sections III and IV we discuss breakdown times and the case of pulsed radiation. In Section V, a short discussion is presented of the theory. (Author)

AD-261 520 Div. 25
(21 Aug 61) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
APPROXIMATE CONTINUOUS OPACITY CALCULATIONS FOR POLYELECTRONIC ATOMS AT HIGH TEMPERATURES,
by R. A. Pappert and S. S. Penner. 30 June 61, 19p. incl. illus. (Rept. no. ZPh-106, App. 2)
(Contract AF 49(638)855)

Unclassified report

DESCRIPTORS: *Atoms, *Absorption, *Atomic energy levels, Atomic structure, Electrons, *High temperature research, Gases, Nitrogen, Fluorine, Numerical analysis, Electron transitions.

Approximate formulas derived by Raizer (JETP (USSR) 37:1079, 1959) and modifications thereof for the Rosseland and Planck mean absorption coefficients in high-temperature gases have been compared with Armstrong's results (Lockheed Missiles and Space Div., Palo Alto, Rept. LMSD-4979, July 15, 1959) for nitrogen at 5 and 20 ev for densities varying between 5 x 10 to the 20th power cm to the -3 power and 5 x 10 to the 15th power cm to the -3 power and 1/(5 x 10 to the 15th power cc). Comparison has also been made with results obtained by Bernstein and Dyson (General Atomic Div. of General Dynamics Corp., San Diego, Report GA 848, July 13, 1959) for the Rosseland mean of fluorine at 10 ev in the density range between 10 to the 21st power cm to the -3 power and 10 to the 18th power cm to the -3 power. The modified Raizer formulas are the consistently better approximation formulas and give agreement to about a factor of two with the numerical results over the parameter range quoted above. (Author)

AD-261 521 Div. 25, 15
(21 Aug 61) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
NON-LINEAR SOLUTIONS OF FOKKER-PLANCK EQUATIONS,
by N. Edmonson, Jr. and T. Summers. 30 June 61, 25p. incl. illus. (Rept. no. ZPh-106, App. 3)
(Contract AF 49(638)855)

Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, *Electromagnetic theory, Electromagnetic fields, *Partial differential equations, Polynomials, Series, Electrons, Ions, Tensor analysis, Functions.

Mathematical statements of the presumed nature of the interaction between a plasma and electromagnetic waves are re-examined for possible methods of exploiting the effects of nonlinear terms in the heretofore linearized versions of magnetohydrodynamic equations. A procedure is studied for orthogonal polynomial expansion of the velocity dependence of the particle distribution functions. The procedure consists of substituting the expansion into the transport equation whose result yields an infinite set of linked equations for the coefficients of the expansion. The set of equations to be studied consists of a finite number of the linked equations combined with the electromagnetic field equations. The important assumptions made are: (1) the plasma is fully ionized, (2) the ions have a Maxwellian distribution, (3) electron-electron interactions can be ignored, (4) electron-ion interactions may be described by the Fokker-Planck collision terms used by Grad (Comm. on Pure and Applied Math., 2:325, 2:331, 1949). The proposed solution method contains implicitly the assumptions that: (5) the electron distribution is in some sense close to a Maxwellian distribution, (6) coefficients of third (products of velocity components taken three at a time) and higher order terms can be ignored.

AD-261 532 Div. 25, 1, 9
(21 Aug 61) OTS price $1.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
PROPOSED TEST PROGRAM ON AEROTHERMOELASTIC SIMILARITY LAWS,
by John Dugundji and John M. Calligeros. June 61, 11p. (Technical note no. 75-3)
(Contract Nonr-184146)

Unclassified report

DESCRIPTORS: Airframes, *Wings, *Aerodynamics, Elasticity, Heat, *Heat transfer, Thermodynamics, Vibration, *Flutter, Test methods, Airplane panels, Aerodynamic heating.

The similarity laws required for experimental aerothermoelastic studies at a free stream Mach number of less than 3.5 are reviewed. An experimental program to check out some of the concepts and ideas involved in these studies is proposed with particular emphasis on flutter of thin, solid, plate-type lifting surfaces, built-up wing structures, and panel flutter. (Author)

AD-261 542 Div. 25
(21 Aug 61) OTS price $6.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
VIBRATIONAL FREQUENCY SPECTRA OF DISORDERED

Division 25 - PHYSICS

LATTICES. I. THE LINEAR CHAIN,
by C. Domb, A. A. Maradudin and others. 1958, 70p. incl. illus. (Technical rept. no. 120)
(Contract AF 18(600)1015)
(AFOSR TN 58-981) Unclassified report

DESCRIPTORS: *Crystals, *Lattices, Combinatorial analysis, Statistical analysis, Solid state physics, Molecules, Atoms, *Vibration, Oscillation.

Using the Moment-Tract method the vibrational frequency spectrum is computed of a randomly disordered, two-component, isotopic linear chain for a wide range of the concentrations of the two kinds of particles and of the mass ratio. With the aid of the theory of random walks on lattices a combinatorial expression is obtained for the even moments of the spectrum and with it moments up to mu sub 20 are calculated. The particular case of a chain is exactly treated in which the mass of one of the isotopic constituents becomes infinite, and the results of this calculation shed light on the form of the spectra for lattices with large but finite mass ratios for the two constituents. The spectra are characterized by the disappearance of the square-root singularity at the maximum frequency which is found in ordered one-dimensional lattices, and by the appearance of impurity bands. The nature of these is discussed. (Author)

AD-261 570 Div. 25
(31 Aug 61) OTS price $1.10

Maryland U., College Park.
STUDY OF DRAG OF CHARGED BODIES IN A PLASMA.
Final rept. 1 Apr 60-31 May 61.
31 May 61, 3p.
(Contract AF 49(638)899)
(AFOSR-1159) Unclassified report

DESCRIPTORS: *Plasma physics, Drag, *Satellite vehicles, Wake, *Secondary emission, Electrons, Static electricity, Spheres.

AD-261 572 Div. 25, 20
(21 Aug 61) OTS price $1.60

Aeon Labs. (Gt. Brit.).
THE FEASIBILITY OF CUTTING SINGLE CRYSTAL SECTIONS OF CADMIUM.
Final technical rept. no. 1, 1 Mar-30 June 61,
by R. Phillips. 30 June 61, 7p. illus.
(Contract DA 91-591-EUC-1710, Proj. OI-7481-61)
Unclassified report

DESCRIPTORS: *Cadmium, *Single crystals, Cutting tools, Microtomes, Aluminum, Copper, Feasibility studies, Nuclear magnetic resonance, Measurement, Crystals.

A Leitz sledge microtome has been modified to stiffen the knife and specimen mounts. The modified instrument has successfully cut 20 - 25 micron thickness slices from single crystal Cd and polycrystalline Al and Cu using a specially sharpened conventional wedge-type steel knife. X-ray examination of the Cd slices reveals that recrystallisation has taken place, thus precluding the use of this method for the manufacture of a stack of slices in parallel orientation for single crystal examinations by nuclear magnetic resonance. (Author)

AD-261 580 Div. 25
(21 Aug 61) OTS price $9.10

Electro-Optical Systems, Inc., Pasadena, Calif.
MASSIVE HYPERVELOCITY PARTICLES BY ELECTRICAL MEANS.
Semiannual progress rept. no. 3, 1 Oct 60-31 Mar 61,
by Henry H. Hilton. 31 Mar 61, 103p. incl. illus. tables (EOS rept. no. 470-20-3)
(Contract DA 04-495-ORD-2000)
Unclassified report

DESCRIPTORS: *Particle accelerators, *Plasma physics, Wire, Detonation, Particles, Tests, Test methods, Instrumentation, Vacuum systems, Photomultipliers, Detectors, Electric switches, Energy, Acceleration, Films, Hypervelocity projectiles, *Hypervelocity guns, Gas flow, Vaporization, Capacitors, Electrical conductance, Oxides, Aluminum.

This rept. includes:
ON THE ACCELERATION OF SMALL PARTICLES TO HYPERVELOCITIES BY EXPLODING FILMS, by Paul H. Levine. 1 Dec 60, 29p. incl. illus. (EOS rept. no. 470-MR-1)

CONDENSATION OF EXPLODING SPHERES, WIRES AND FILMS, by Saul Feldman. 25 Nov 60, 29p. incl. illus. table (EOS rept. no. 470-MR-2)

Techniques for obtaining hypervelocity particles by electrical means are investigated. Use is made of electrically exploding materials to create a very high-density, high-velocity gas flow. This flow is used itself or coupled to the acceleration of small projectiles. Exploded aluminum films with a mass of 1 mg achieved average vapor velocities between 20-30 km/sec. Using Fiberglas in a gun barrel configuration to confine and direct the plasma, projectiles of aluminum oxide initially weighing about 50 micrograms were accelerated to velocities of 7 km/sec. There is some evidence of fragmentation of the projectile. (Author)

AD-261 585 Div. 25, 8
(21 Aug 61) OTS price $22.25

Geophysics Corp. of America, Boston, Mass.
SURVEY AND EVALUATION OF PHENOMENA AND TECHNIQUES IN THE ULTRAVIOLET, VISIBLE AND SUBMILLIMETER REGION FOR APPLICATION TO DETECTION AND ASTROSURVEILLANCE. PART I.
Final rept.,
by R. M. Chapman, R. O'B. Carpenter and others.
1 July 61, 436p. incl. illus. tables (GCA technical rept. no. 61-35-A)
(Contract AF 19(604)7412)
(AFCRL-550, pt. 1) Unclassified report

DESCRIPTORS: Electromagnetic waves, *Guided missiles, *Satellite vehicles, *Ultraviolet radiation, *Detection, Light, Targets, *Microwaves, *Air intelligence, Military intelligence.

Phenomena and techniques are to be evaluated in the ultraviolet, visible, and submillimeter (40 to 2000 microns) regions of the electromagnetic spectrum which may be applicable to current and future requirements in the areas of detection and astrosurveillance, i.e., military activities associated with missiles, satellites and other vehicles with high altitude trajectories. In general, radar and infrared techniques and phenomena are excluded from consideration. Study concerned the general properties of backgrounds, effects of object-environment interaction, and detection and recognition techniques. (Author)

AD-261 588 Div. 25
(5 Sep 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SURFACE ANISOTROPY ENERGY DENSITY OF A FERROMAGNET,
by R. F. Soohoo. 18 Aug 61, 8p. incl. table.
(Rept. no. 53G-0063)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Ferromagnetic materials, *Ferromagnetism, *Thin films, Resonance absorption, *Solid state physics, Magnetostriction, Magnetostrictive resonators, Lattices, Impedance, Mathematical analysis, Crystals.

By a combined theoretical-experimental approach, the shape of the surface anisotropy energy surface as well as the value of the surface anisotropy energy density of a ferromagnet is determined. The results of the calculation are summarized and their implications discussed in relation to existing experimental results on spin wave resonance in thin films. (Author)

AD-261 616 Div. 25
(21 Aug 61) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
CORRELATION FUNCTIONS IN A PLASMA,
by I. Oppenheim. 30 June 61, 9p. (Rept. no. ZPh-106, App. 6)
(Contract AF 49(638)855)
Unclassified report

DESCRIPTORS: *Correlation techniques, *Plasma physics, *Statistical functions, Electrical potential, Transport properties, Mathematical analysis, Electrons, Protons, Differential equations, Integral equations.

The correlation function between the potential at point a and the potential at point b in a fully ionized plasma is computed. The correlation function is shown to be a long-range function of the distance between points a and b. This result has significance in the treatment of the interaction of radiation with a plasma because of its effect on transport properties in a plasma. (Author)

AD-261 655 Div. 25
(22 Aug 61) OTS price $1.10

Carnegie Inst. of Tech., Pittsburgh, Pa.
THERMAL ETCH PITS AND DISLOCATIONS IN SILVER,
by W. L. Winterbottom, W. H. Robinson, and J. P. Hirth. 15 Mar 61, 3p. illus., 12 refs.
(Contract AF 49(638)551)
(AFOSR-731) Unclassified report

DESCRIPTORS: *Silver, *Single crystals, *Crystal structure, Lattices, Deformation, Surface properties, High temperature research, Low pressure research, Evaporation, Impurities, Theory, X-ray diffraction analysis, Vapors, Chemical impurities, Adsorption, Diffusion, *Chemical reactions, *Metallic crystals, Microstructure.

Silver single crystals having (100), (110) and (111) orientations were heated to 750 C in a vacuum of about 1/100,000 to 10 to the -6th power mm of Hg. The density of the thermal etch pits which resulted agreed with the estimate of the dislocation density as obtained with the Lambot X-ray method. The formation of these relatively sharp thermal etch pits is interpreted as being a result of the low undersaturation of Ag vapor and the presence of impurities. (Author)

AD-261 656 Div. 25
(22 Aug 61) OTS price $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
STUDY OF DISLOCATION ARRAYS BY X-RAY DIFFRACTION MICROSCOPY,
by W. H. Robinson and H. J. Levinstein. 15 Mar 61, 7p. illus.
(Contract AF 49(638)551)
(AFOSR-506) Unclassified report

DESCRIPTORS: *Single crystals, Copper, Silver, *Metallic crystals, *Crystal structure, Microstructure, *X-ray diffraction analysis, Lattices, Deformation, Metals, Surface properties.

X-ray diffraction micrographs obtained from single crystals of Ag and Cu showed that it is not possible to resolve individual dislocations in these crystals. Cr radiation and high resolution spectroscopic plates were used. The lineage structure in these crystals was very sharply portrayed. The failure to observe individual dislocations is probably due to high absorption of the CrKalpha leading to only slight penetration and the extension of dislocations in these metals. (Author)

AD-261 661 Div. 25, 8
(23 Aug 61) OTS price $1.10

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS.
Monthly technical status rept. no. 11, 1-31 Mar 60,
by Josef Eitzenberger, W. Fischer, and others. 30 Apr 60, 9p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, *Phase measurement, Satellite vehicles, *Instrumentation, Refraction.

Work will concern the design and construction of a ground receiver installation for determination of the angular error of electromagnetic waves passing through the ionosphere; design of a satellite package to work with the above instrumentation using the swept frequency technique; and design and construction of a laboratory device for measuring the properties of plasma at 10 CM by means of phase differences and amplitude comparisons of electromagnetic waves passing through the plasma. (Author)

AD-261 662 Div. 25
(22 Aug 61) OTS price $11.50

Davos Observatory (Switzerland).
INVESTIGATION ON THE SPECTRAL INTENSITY OF ULTRAVIOLET SKY AND SUN-SKY RADIATION (BETWEEN 297.5 MILLIMICRONS AND 370 MILLIMICRONS) UNDER DIFFERENT CONDITIONS OF CLOUDLESS WEATHER AT 1590 M A.S.L.,
by Paul Bener. Dec 60, 156p. incl. illus. tables, 53 refs. (Technical summary rept. no. 1)
(Contract AF 61(052)54)
(AFCRL-626) Unclassified report

DESCRIPTORS: *Ultraviolet radiation, Sky, Sky brightness, *Geophysics, Solar spectrum, Atmosphere, Switzerland, Absorption, Ozone.

The results are presented of extended records of the spectral distribution of ultraviolet solar and sky radiation in the spectral region between 295 millimicrons and 370 millimicrons. The records were obtained with a recording spectrometer consisting of a double monochromator combined with a photomultiplier and a recorder. A diffuser sphere was applied as receiver for the incoming radiation to obtain measurements following the cosine law. Diagrams showing the spectral intensity as a function of wavelength, solar altitude and amount of atmospheric ozone are presented. Up to 330 millimicrons the spectral intensity of ultraviolet sky and global radiation increases rapidly because of diminishing ozone absorption; this increase covers between wavelengths of 297.5 millimicrons and 330 millimicrons several orders of magnitude. No considerable change of spectral intensity is observed in the wavelength region between 330 millimicrons and 370 millimicrons. The effect of ozone increase from 0.200 cm to 0.300 cm on the spectral intensity of ultraviolet sky radiation corresponds for 300 millimicrons to a diminuation of intensity by factors varying between 3, 5 and 16, depending on solar altitude. The corresponding variation in the case of global radiation amounts to factors between 8 and 16. (Author)

AD-261 663 • Div. 25, 8
(23 Aug 61) OTS price $1.10

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS.
Monthly technical status rept. no. 13,
1-30 June 60,
by J. Eitzenberger, Wilh. Fischer and others.
31 July 60, 10p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, *Phase measurement, *Instrumentation, Radio receivers, Satellite vehicles, Refraction, Satellite vehicles.

Work concerned the development of phase measuring equipment for the penetration of plasma. Heterodyne frequency techniques were considered.

AD-261 664 Div. 25, 8
(23 Aug 61) OTS price $1.10

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS.
Monthly technical status rept. no. 12,
1-30 Apr 60,
by J. Eitzenberger, W. Fischer, and others.
31 May 60, 9p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, *Phase measurement, *Instrumentation, Wave guides, Satellite vehicles, Refraction.

Effort in the design of a laboratory device for measuring the properties of plasma at 10 cm concerned the development of a plasma penetration unit. In order to reduce mismatchings, the entire circuit employs waveguide techniques. A new plasma container of a diameter of 45 cm and a height of 20 cm was established in connection with the penetration device. The container is closed on both sides with glass plates of 45 mm thickness and has three inlets designed for the anode, the cathode, and the probe electrode. The container was tested under vacuum up to 0.1 torr. During these tests, the glass plates had to withstand a pressure of about 1.6 tons.

AD-261 665 Div. 25, 8
(23 Aug 61) OTS price $1.60

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS.
Monthly technical status rept. no. 19,
1-28 Feb 61,
by J. Eitzenberger, W. Fischer, and others.
30 Mar 61, 12p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, *Phase measurement, *Instrumentation, Satellite vehicles, Cavity resonators, Refraction, Cavity resonators.

Phase measurement experiments were conducted by the heterodyne method in connection with plasma penetration studies. Investigations on the cavity resonance method were continued.

AD-261 666 Div. 25, 8
(23 Aug 61) OTS price $1.10

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS.
Monthly technical status rept. no. 20,
1-31 Mar 61,
by J. Eitzenberger, W. Fischer, and others.
30 Apr 61, 9p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: Refraction, Radio receivers, Satellite vehicles, *Instrumentation, *Phase measurement, Interferometers, Physical properties, Magnetohydrodynamics, *Ionosphere, *Electromagnetic waves, *Plasma physics.

Study concerned the deflection of an electromagnetic wave in passing through the atmosphere. Experiments carried out with 10-cm wave length proved that shorter wave lengths are more satisfactory for performing exact measurements employing a paraffin prism of 55-cm diameter. Work in plasma penetration investigation by the heterodyne method, involved an extension of the device to perform static as well as pulse measurements.

AD-261 667 Div. 25, 8
(23 Aug 61) OTS price $1.10

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING

DEVICE IN THE FIELD OF PLASMA ELECTRONICS. PART II. CORRECTION OF ANGULAR AND RANGE ERRORS.
Monthly technical status rept. no. 22, 1-31 May 61,
by J. Eitzenberger, G. Biener, and others.
30 June 61, 5p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, Phase measurement, *Instrumentation, *Satellite vehicles, Radio receivers, Refraction.

The tests conducted in connection with the deflection of electromagnetic wave through the atmosphere concerned microwaves of 3 cm wave length. These tests especially dealt with measurements of the amplitude, a concentrated electromagnetic field being applied to the paraffin prism. (Author)

AD-261 668 Div. 25, 8
(23 Aug 61) OTS price $1.60

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS. PART II. CORRECTION OF ANGULAR AND RANGE ERRORS.
Monthly technical status rept. no. 21, 1-30 Apr 61,
by J. Eitzenberger, G. Biener, and others.
31 May 61, 15p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, *Phase measurement, *Instrumentation, Satellite vehicles, Radio receivers, Refraction, Argon.

The angular deflection of electromagnetic waves through the atmosphere was studied. Tests were conducted for the angular deflection of 3-cm wavelengths affected by a paraffin prism. A better transmitting arrangement for the tests was considered. Theoretical considerations proved that by using a section of a rotational ellipsoid, a better field strength concentration can be obtained than is the case with a normal parabolic reflector. Plasma penetration measurements were performed. A small plasma container became leaky after some experiments. By means of a new power supply, a plasma with an electron concentration of 10 to the 11th power electrons/cc was produced by a current of 50 amp.

AD-261 669 Div. 25, 8
(23 Aug 61) OTS price $1.10

Battelle Institut, Frankfurt, Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS.
Monthly technical status rept. no. 17, 1-31 Dec 60,
by J. Eitzenberger, W. Fischer and others.
31 Jan 61, 9p. incl. illus.
(Contract DA 91-591-EUC-1018)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Ionosphere, Magnetohydrodynamics, Physical properties, Interferometers, *Phase measurement, *Instrumentation, Satellite vehicles, Radio receivers, Refraction.

Phase measurements were performed according to the null methods at 3100 mc in connection with the study of plasma penetration using heterodyne techniques. The angular deflection of electromagnetic waves passing through the atmosphere was studied by means of an antenna arrangement. The mean refraction angle corresponded well with theoretical values.

AD-261 673 Div. 25
(22 Aug 61) OTS price $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
CONSERVATION PRINCIPLES IN MULTIVELOCITY ELECTRON FLOW.
Rept. on Proj. Michigan,
by Gunnar Hok. June 61, 25p. incl. illus.
(Rept. no. 2900-265-I)
(Contract DA 36-039-sc-78801)
Unclassified report

DESCRIPTORS: *Electron guns, Electrons, *Transport properties, Velocity, Kinetics, Electromagnetic waves, Particles, Mathematical analysis, Partial differential equations.

This analysis considers the extension of Poynting's theorem to an electron gas with a continuous distribution of velocities. In particular, an extension of the concept of kinetic potential is attempted, since this concept has proved itself very useful in the investigation of single-velocity flow. It is found that in three dimensions the electrokinetic flow vector cannot be expressed as the product of the convection-current density and a single scalar quantity of the dimension potential. In one-dimensional applications, however, this circumstance is immaterial. Another difficulty is encountered when a small perturbation component on a steady state is considered. The nonlinear Boltzmann transport equation gives a linear equation between the first-order perturbations, but the nonlinearity makes possible a conversion of part of the perturbation power flow to d-c power flow. In other words, the power flow associated with a single-frequency perturbation is not necessarily conserved in multivelocity flow, even in the absence of an a-c Poynting vector. (Author)

AD-261 679 Div. 25
(22 Aug 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
VIBRATIONAL ENERGY EXCHANGE IN QUANTUM AND CLASSICAL MECHANICS.
Technical rept. on Physics,
by Donald Rapp, July 60, 25p. incl. illus. (Rept. no. 6-90-61-14)
Unclassified report

DESCRIPTORS: *Quantum mechanics, Molecules, Vibration, *Vibration mechanisms, Perturbation theory, Mechanics, Probability, Scattering.

The probability of vibrational energy exchange in a molecular collision can be calculated using (1) a wave-mechanical treatment using the method of distorted waves, (2) a time-dependent perturbation procedure in which the perturbation energy is obtained as a function of time from the classical collision trajectory, and (3) a purely classical calculation of the energy transferred to a classical vibrator. These methods are reviewed, related, and compared. (Author)

Division 25 - PHYSICS

AD-261 701 Div. 25
(22 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENTS AND CALCULATIONS OF THE EFFECTS OF DISTORTIONS IN THE COLLECTOR SURFACE ON EFFICIENCIES OF UMBRELLA-TYPE SOLAR COLLECTORS,
by Victor R. Bond. Aug 61, 44p. incl. illus.
(Technical note no. D-925)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-925.

DESCRIPTORS: Aluminum, *Solar furnaces, Deformation, Bodies of revolution, *Curved mirrors, *Structural shells, Tensile properties, Reflectors, *Stresses.

The meridional tensions along the ribs in a Mylar-covered umbrella-type solar collector produce a distortion in the reflecting surface that is detrimental to the image in the focal plane. Investigation was made to obtain measured and calculated geometric efficiencies of umbrella-type collectors as affected by these surface distortions. These studies show that if the tension transverse to the ribs is increased relative to the meridional tensions, the distortion is reduced and higher efficiencies can be attained, and if the transverse tension is small, the number of ribs in the collector must be increased for higher efficiencies. (Author)

AD-261 714 Div. 25, 4
(23 Aug 61) OTS price $2.60

Oregon State U., Corvallis.
FORMATION AND OPTICAL BLEACHING OF F CENTERS IN X-RAYED POTASSIUM CHLORIDE CRYSTALS.
Technical rept. no. 4 on A Magnetic Study of Color Centers in Alkali Halides,
by Fumio Okamoto and Allen B. Scott. 15 July 61, 32p. incl. illus. tables, 22 refs.
(Contract Nonr-128605, Proj. NR 018 701)
Unclassified report

DESCRIPTORS: *Alkali metal compounds, Optics, *Potassium compounds, *Halides, Chlorides, *Color centers, Single crystals, Growth, X-rays.

Single crystals of potassium chloride were grown from aqueous solution. X-ray darkenability and optical bleaching rate of F centers were measured at room temperature and the rate expressions were obtained experimentally for the processes. X-ray darkenability was also studied in crystals containing secondary centers, such as M, R, and N centers, which were produced by the preceding optical bleaching of F centers. Upon x-ray irradiation, F centers formed rapidly with the sudden decrease of the secondary centers. The same rate expression as that obtained for the F-center formation in virgin crystals is also applicable to this process. In this case the rate of F-center formation is dependent on the number of F centers bleached by the preceding optical bleaching but not on the kind of crystals. (Author)

AD-261 719 Div. 25, 14, 6
(22 Aug 61) OTS price $3.60

Optics Technology, Inc., Belmont, Calif.
RESEARCH AND DEVELOPMENT OF INFRARED FIBER OPTICS.
Interim engineering rept. no. 1, 1 May-1 Aug 61. 10 Aug 61, 38p. incl. illus.
(Contract AF 33(616)8324)
Unclassified report

DESCRIPTORS: *Infrared optical materials, *Glass textiles, *Ceramic fibers, *Infrared radiation, Wave transmission, Mathematical analysis, Coatings, *Infrared detectors, *Infrared photoconductors, Germanium, Design, Infrared filters, Absorption, Arsenic compounds, Sulfides.

The 3 phases of research briefly enumerated are: (1) theoretical and experimental work on the waveguide properties of fibers, (2) experimental work on the deposition and characteristics of infrared detectors, and (3) experimental work on the drawing and testing of fibers. Theoretical and experimental results demonstrate the improvements in transmission efficiency to be gained when using small fibers. Surface wave conduction is shown to enhance the transmission of very small fibers whose core material has a higher absorption coefficient than that of its coating. The problems of detectors and detector deposition onto fiber ends are discussed, and working conclusions are reached based upon a literature survey and experiments on large-scale models. A materials survey, still in progress, has revealed both sources and materials for use in infrared fiber optics. Experiments with arsenic trisulfide are outlined and results, where available, are presented. Future research is briefly outlined. (Author)

AD-261 731 Div. 25
(24 Aug 61) OTS price $11.00

Stanford U., Calif.
AN X-RAY DIFFRACTION STUDY OF LIQUID STRUCTURE.
Final rept.
by H. H. Paalman and C. J. Pings. June 61, 143p. incl. illus. tables.
(Contract AF 49(638)469)
(AFOSR-811)
Unclassified report

DESCRIPTORS: X-rays, *X-ray diffraction analysis, *Liquids, *Molecules, *Nitrogen, Cryogenics, Thermodynamics, Molecular spectroscopy, Molecular association, Statistical analysis.

A comprehensive program is presented for the study of liquid-state structure. Through the application of X-ray diffraction techniques, the pair distribution function may be obtained for a given state of a liquid system. This information is basic to the theoretical treatment of liquids by statistical mechanical methods. Experimental apparatus was fabricated for carrying on diffraction experiments over an extensive range of pressure and temperature. A cylindrical beryllium cell, capable of withstanding several hundred psi, was used. The components were designed for the study of condensed low atomic weight elements at cryogenic temperatures. Control systems maintained the desired pressure and temperature within 0.5 psi and 0.2 C respectively. The theory for the interpretation of liquid diffraction data was critically reviewed. A synthesis of the important recent developments is presented in a general analytical scheme. Liquid nitrogen was studied at 100 psia and -193.5 C. The results compared favorably with earlier work reported in the literature. (Author)

AD-261 732 Div. 25, 8
(23 Aug 61) OTS price $2.60

Ronson Metals Corp., Newark, N. J.
MATERIALS FOR AND THE MECHANISM OF GETTERING MULTIPLE COMPONENT GASES.
Scientific rept. no. 1, 8 Mar-8 June 61, by E. I. Doucette. 30 June 61, 25p. incl. table.
(Contract AF 19(604)8430)
(AFCRL-578) Unclassified report

DESCRIPTORS: *Degasification, *Gas diffusion, *Gases, Adsorption, *Electron tubes, Metals, Surfaces, Temperature, Chemical reactions, Mixtures, Mass spectroscopy, Mass spectrometers, Vacuum apparatus, Cyclotrons, Gas ionization, Reaction kinetics, Theory, Barium alloys, Materials, Pressure.

The basic vacuum system for the study was constructed utilizing an omegatron mass spectrometer which is driven by an automatically recycling oscillator. In this way a complete spectrum of mass composition at frequent intervals may be obtained throughout the gettering process. By taking into consideration the probabilities of the various reactions and interactions, an expression is obtained for the fraction of surface sites covered at the getter surface. This expression is then used to predict the expected behavior of a continuous getter under various conditions of temperature and pressure. (Author)

AD-261 747 Div. 25
(22 Aug 61) OTS price $2.60

Wayne State U., Detroit, Mich.
THEORETICAL INVESTIGATIONS ON THE LIGHT SCATTERING OF SPHERES. XIII. THE WAVE LENGTH EXPONENT OF DIFFERENTIAL TURBIDITY SPECTRA,
by Wilfried Heller, Hari L. Bhatnagar and others. 31 July 61, 29p. incl. tables (Technical rept. no. 45)
(Contract Nonr-73600, Proj. NR 051-380)
Unclassified report

DESCRIPTORS: *Colloids, Spheres, *Light, Scattering, Particles, Molecules, Refractive index, Measurement, Refractive properties, Theory, Light transmission.

The exact theory of the wave length exponent of the turbidity is developed for Rayleigh scattering and Debye-scattering and, particularly for Mie-scattering by non-absorbing spheres. The basic exponent n is computed from Mie-turbidity data, reported previously. The actual exponent to be expected in a given dispersed system, n sub o, is found to depend on three additional factors: (1) the rate of change of the turbidity with the relative refractive index of the spheres; (2) the dispersion of the relative refractive index of the spheres; and (3) the refractive index of the medium. The advantages and limitations of an application of the wave length exponent to particle size determinations are discussed and labor saving approximating n(alpha)-relations, suitable for first approximation results on particle size, are given. The effect of heterodispersion upon the wave length exponent is briefly discussed. (Author)

AD-261 762 Div. 25, 8
(23 Aug 61) OTS price $4.60

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM.
Quarterly progress rept. no. 6, 16 Mar-15 June 61. by R. Novick. 15 June 61, 44p. incl. illus.
(Rept. no. CU-6-61-SC-78330)
(Contract DA 36-039-sc-78330)
Unclassified report

DESCRIPTORS: *Magnetrons, *Microwave amplifiers, *Radio astronomy, Cesium, Single crystals, Microwave equipment, Superconductors, Liquefied gases, Helium, Relaxation time, Krypton, Tritium, Sodium, Lithium, Barium, Cadmium, Radioactive isotopes, Paramagnetic crystals, Tests, Resonance absorption, Lattices, Nuclei, Solar corona, Ruby, Nuclear spins, Microwave frequency, Salts, Copper compounds, Telescopes, Radio equipment, Optical systems, Molecular beams, Electron bombardment, Phonons, Hyperfine structure, *Masers.

Several 6 mm magnetrons were developed for the microwave cavity particle detector and several tracks were observed with this apparatus. Radioastronomical measurements at 21 cm are given. A 50 kmc rutile maser was developed for use in conjunction with the radioastronomical observation of NVII nitrogen line in the sun's corona, for which a preliminary search was made. Results are given for paramagnetic relaxation size effect studies on copper Tutton salt. Experiments with pulsed ruby and cesium vapor optical maser systems are described. A new experiment on second sound in liquid helium II is outlined. Preliminary results are given for optical pumping of radioactive cadmium isotopes, as well as for level crossing experiments. Progress is described on an experiment involving the interaction of molecules and conducting surfaces. Several atomic beam studies are described, including work on lithium and O-15. A high sensitivity optical resonance apparatus is described. (Author)

AD-261 770 Div. 25, 17
(22 Aug 61) OTS price $26.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HEAT TRANSFER AND THERMODYNAMIC MODELING (Teploperedacha I Teplovoye Modelirovaniye).
May 60, 554p. 240 refs. (Trans. no. MCL-222 of Izdatel'stvo Akademii Nauk SSSR, Moscow, 418p., 1959)
Unclassified report

DESCRIPTORS: *Heat transfer, *Thermodynamics, USSR, Technological intelligence, Heat, Tables, Solids, Electrical cables, Shipborne, Liquids, *Liquid metals, Thermal conductivity, Theory, Transport properties, Deuterium.

AD-261 771 Div. 25, 17, 14
(22 Aug 61) OTS price $18.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CERTAIN STRENGTH PROBLEMS OF SOLIDS (SELECTED ARTICLES) (Nekotoryye Problemy Prochnosti Tverdogo Tela).
25 Apr 61, 284p. incl. tables, 174 refs. (Trans. no. MCL-505 of Izdatel'stvo Akademii Nauk SSSR, Moscow, Leningrad, pp. 68-98, 141-164, 172-178, 194-206, 230-237, 268-272, 325-332, 1959)
Unclassified report

DESCRIPTORS: *Solids, Metals, Alloys, Plastics, *Materials, *Mechanics, *Mechanical properties, Physical properties, Stresses, Deformation, Elasticity, Plasticity, Diffusion,

Creep, Failure (Mechanics), Fatigue (Mechanics), Rupture, Fracture (Mechanics), Microstructure, Lattices, Aluminum, Steel, Nickel, Nickel alloys, Tin, Powder metals, Copper, Hydrogen embrittlement, Phase transitions, Heat treatment, Temperature, Crystal structure, Theory, USSR, Cellulose, Glass.

Contents: Time dependence of strength in various loading cycles; The effect of stress and strain on diffusion processes; Diffusion creep of powdered-metal specimens pressed from Fe powder; The effect of Al and Cu on the mechanism of Ni deformation; Examination of hydrogen embrittlement of 2-phase Ti alloys; Hydrogen embrittlement of steel as a function of the conditions of mechanical testing; The effect of the degree of purity on cold brittleness and other properties of Cr; Study of the size effect in steels of various strengths during plastic deformation and failure; Effect of a high deformation rate on mechanical properties of a V-95-type alloy after different stages of aging; Fatigue strength under repeated loading, as a function of specimen size; Fundamentals of the statistical theory of strength.

AD-261 773 Div. 25
(22 Aug 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRENGTH OF MATERIALS (SELECTED CHAPTERS) PART I (Soprotivleniye Materialov),
by A. A. Il'yushin and V. S. Lenskiy. 4 Apr 61, 299p. incl. tables (Trans. no. MCL-623 pt. 1, of Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury, Moscow, pp. 5-12, 62-287, 1959)
Unclassified report

DESCRIPTORS: *Materials, *Mechanics, Stresses, Deformation, Creep, Elasticity, Plasticity, Mechanical properties, *Textbooks, Vibration, Radiation damage, Test methods, USSR, Theory, Internal friction, Mathematical analysis, Rods, Determination.

The book is based on lectures delivered at the faculty of mathematics and mechanics of Moscow University, and develops the theory of the strength of materials. Contained are problems on the equilibrium and stability of the simplest construction elements with elastic and elastoplastic deformations, as well as data on plastic flow forming during pressure shaping of materials, creep, dynamic strength, vibrations and propagation of elastic and plastic waves, the effects of temperature, deformation rate, radioactive irradiation, and the strength and plasticity of materials. A description is given of the experimental technique for investigating the mechanical properties of materials. (Author)

AD-261 774 Div. 25
(22 Aug 61) OTS price $14.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRENGTH OF MATERIALS (SELECTED CHAPTERS) PART II,
by A. A. Il'yushin and V. S. Lenskiy. 4 Apr 61, 219p. (Trans. no. MCL-623, pt. 2, of Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury, Moscow, pp. 300-517, 1959)
Unclassified report

DESCRIPTORS: *Mechanics, *Textbooks, *Materials, Stresses, Deformation, Plasticity, Metals, Elasticity, Processing, Creep, Impact shock, Shock waves, Jets, USSR, Mechanical properties, Theory, Mathematical analysis, Determination.

AD-261 785 Div. 25, 4
(22 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A STUDY OF EQUILIBRIUM IN A ZIRCONIUM-NITROGEN SYSTEM AT HIGH TEMPERATURES AND THE DEPENDENCE OF THE FREE ENERGY OF FORMATION OF ZrNx ON ITS COMPOSITION AND STRUCTURE,
by Ye. I. Smagina, V. S. Kutsev, and B. F. Ormont. 27 July 61, 27p. incl. illus. tables, 31 refs. (Trans. no. MCL-896 of Fiziko-Khimicheskiy Institut, Vyp 2: Problemy Fizicheskoy Khimii 2: pp. 118-131, 1959)
Unclassified report

DESCRIPTORS: *Zirconium compounds, *Nitrides, Zirconium, Nitrogen, Chemical equilibrium, High temperature research, Thermodynamics, Refractory materials, Heat of formation, Synthesis, Thermochemistry, Phase studies, Chemical analysis, X-ray diffraction analysis, Molecular structure, USSR.

A method of studying equilibria in refractory nitride systems at 1500-2800 K was developed. The equilibrium in the system NrN(x) - N2 was studied in the temperature range 2000-2800 K, the pressure range 0.1-300 mmHg, and a range of change in x from 0.7 to 1.0. The dependence of the equilibrium compositions on temperature and pressure was established. The composition ZrN is a special case. The decomposition equation used in the literature, ZrN yields Zr + 1/2 N2, was not corroborated at the pressures and temperatures investigated. As the composition of ZrN(x) changes, the heats and free energies of formation change considerably; this must be taken into account in thermodynamic calculations. As the composition changes from ZrN(0.56) to ZrN(1.0), the heats of formation change from 56,100 to 87,900 cal/mole. The conditions of formation of zirconium nitrides of given composition were studied, and a method of synthesizing them was developed. (Author)

AD-261 798 Div. 25
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE THEORY OF EXCITATION OF STANDING WAVES IN PLASMA, .
by R. Leven. 27 July 61, 9p. incl. illus. (Trans. no. MCL-973 of Vestnik Moskovskogo Universiteta, Seriya 3, Fizika Astronomiya 4:32-37, 1960)
Unclassified report

DESCRIPTORS: *Plasma physics, *Plasma oscillations, Electron beams, *Electromagnetic waves, Wave transmission, Excitation.

We derive a dispersion equation for standing waves in bounded plasma, which makes it possible to obtain values of the frequencies and increments for any ratios between the densities of a beam and plasma without the use of computers. The results are compared with experimental and theoretical data obtained by various authors. (Author)

AD-261 802 Div. 25
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE CRYSTAL STRUCTURE OF ALPHA AND BETA CDS;

AS WELL AS WURSITES (XIV),
by F. Ulrich and W. Zachariasen. 26 June 61, 18p. incl. illus. tables (Trans no. MCL-996 of Z. Fur Kristallographie 62:pp. 260-273, 1925)
Unclassified report

DESCRIPTORS: *Sulfides, *Zinc compounds, *Cadmium compounds, Crystal structure, Crystals, Phase studies, Single crystals, X-ray diffraction analysis, Norway.

Natural ZnS is found in 2 modifications, the regular zinc blend and, more rarely, the dihexagonal-pyramidal wurtzite. As Zn and Cd show great physico-chemical analogy, a dimorphism of CdS was considered probable. In order to investigate this possibility, amorphous (xantochroite) and greenockite specimens of CdS were prepared. X-ray studies of the crystal structures showed that the dimorphism of ZnS is completely analogous with that of CdS; structural analogies exist for wurtzite and greenockite on one hand, and for zinc blend and amorphous CdS on the other.

AD-261 810 Div. 25, 2
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE SECRET OF THE FORCES OF GRAVITY,
by A. Presnyakov. 14 July 61, 3p. (Trans. no. MCL-1057 from Ekonomicheskaya Gazeta 13, p. 4, 15 Jan 61)
Unclassified report

DESCRIPTORS: *Gravity, Particles, Theory, *Relativity theory, USSR, Scientific research.

AD-261 812 Div. 25
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SELF-SIMILAR SOLUTIONS OF THE EQUATIONS OF A LAMINAR BOUNDARY LAYER IN MAGNETOHYDRODYNAMICS,
by N. I. Pol'skiy and I. T. Shvets. 27 July 61, 8p. (Trans. no. MCL-1070 of Doklady Akademii Nauk SSSR 136:1051-1054, 1961)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Laminar boundary layer, Gas flow, Fluid flow, Mathematical analysis, Fluid mechanics, Magnetic fields, Partial differential equations, USSR.

AD-261 814 Div. 25, 8
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INFLUENCE OF AN ELECTRICAL FIELD ON THE TEMPERATURE OF ELECTRONS, ELECTRIC CONDUCTIVITY, AND THERMIONIC EMISSION OF SEMICONDUCTORS,
by I. M. Dykman and P. M. Tomchuk. 26 July 61, 16p. (Trans. no. MCL-1092 of Fizika Tverdogo Tela 3:632-641, 1961)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Electric fields, Temperature, Electrons, Conductivity, *Thermionic emission, *Semiconductors, Solid state physics, Mathematical analysis, Lattices, Crystals, Photons, Phonons, Plasma physics, Gas ionization, *Electrical conductance, Plasma oscillations, Statistical distributions.

The spherically symmetrical part is determined of the distribution function of fast conduction electrons in a semiconductor when an electric field is present. The criteria are established at which there is a noticeable heating of the electron gas by the field. The thermoelectron current I is calculated. Two limiting cases are analyzed: (1) the collision ionization has practically no effect on the value of I, and (2) collision ionization is essential. In the first case the distribution function of fast electrons (actual for thermoemission) is approximately Maxwellian in respect to the temperature of the electrons, and equals the temperature of the lattice To. The dependence of I on To and the distribution of the thermoelectrons according to energies is close here to the corresponding characteristics of equilibrium thermoemission, but the value of I can by several orders exceed the current of equilibrium thermoemission. In the second case the distribution function of fast electrons, generally speaking, differs from the Maxwellian. Under difinite conditions, however, it can also be close to the maxwellian when the electron temperature is above To but below T. (Author)

AD-261 818 Div. 25
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE STRUCTURE OF SLOW MAGNETOHYDRODYNAMIC SHOCK WAVES WITH BAROTROPY,
by A. G. Kulikovskiy. 26 July 61, 8p. incl. illus. (Trans. no. MCL-1134 of Doklady Akademii Nauk SSSR 137:810-813, 1961)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Shock waves, USSR, Technological intelligence, Mathematical analysis, Differential equations, *Thermodynamics.

AD-261 819 Div. 25, 8
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CERTAIN FEATURES OF THE TRANSVERSE PROPAGATION OF HIGH-FREQUENCY WAVES IN MAGNETOACTIVE PLASMA,
by B. N. Gershman. 27 July 61, 8p. (Trans. no. MCL-1135 of Doklady Akademii Nauk SSSR 137:822-825, 1961)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Plasma physics, Gas ionization, *Magnetohydrodynamics, Magnetic fields, Resonance absorption, Wave analysis, Mathematical analysis, Radio waves, High frequency, Propagation, *Electromagnetic waves, *Wave transmission.

Certain features of the propagation of high-frequency waves in a uniform plasma located in a constant magnetic field are discussed. These features are associated with the thermal motion of electrons and are manifested sufficiently effectively only when propagation occurs in a direction perpendicular (or practically perpendicular) to the field (transverse propagation). (Author)

AD-261 820 Div. 25
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE FLOW OF VISCOUS CONDUCTING GAS IN A TRANS-

VERSE MAGNETIC FIELD WITH HEAT EXCHANGE,
by E. P. Zimin. 26 July 61, 3p. (Trans. no. MCL-1137 of Prikladnaya Matematika i Mekhanika 25:381-382, 1961)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Heat transfer, Thermodynamics, Magnetic fields, USSR, Technological intelligence, Liquids, Mathematical analysis, Differential equations.

AD-261 830 Div. 25
(22 Aug 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
JOURNAL OF TECHNICAL PHYSICS (SELECTED ARTICLES),
by L. S. Solov'ev, V. P. Demutskiy, and R. V. Polovin. 27 July 61, 37p. incl. illus. 16 refs. (Trans. no. MCL-1181 of Zhurnal Tekhnicheskoy Fiziki 31:pp. 407-427, 1961)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, USSR, Technological intelligence, *Plasma physics, Magnetic fields, Gas flow, Ionization, Detonation, Shock waves, *Electromagnetic waves, Mathematical analysis, Differential equations.

Contents:
Magnetohydrodynamic surface waves, by L. S. Solov'ev
Shock ionization and detonation in magnetohydrodynamics, by V. P. Demutskiy and R. V. Polovin

AD-261 832 Div. 25, 8
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE EFFECT OF AN ELECTRIC FIELD ON ELECTRON TEMPERATURE AND ELECTRIC CONDUCTIVITY AND THERMOELECTRON EMISSION OF SEMICONDUCTORS,
by P. M. Tomchuk. 27 July 61, 19p. (Trans. no. MCL-1184 of Fizika Tverdogo Tela 3:1019-1030, 1961)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Electric fields, *Semiconductors, *Thermionic emission, Temperature, Conductivity, Mathematical analysis, *Plasma physics, Gas ionization, *Plasma oscillations, Moments, Statistical distributions, Electrons, *Electrical conductance.

The distribution function of an electron gas in the presence of a constant electric field is found from the kinetic equation. The reactions of the electrons with each other (including both far and near collisions) and with plasma oscillations are taken into consideration. The relation between the moments in the Chapman-Cowling method and those derived from the Landau equation is established. The effect of plasma oscillations on electric conductivity is estimated. The limits of applicability of the Landau method are discussed. (Author)

AD-261 833 Div. 25, 4
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE MELTING POINTS OF LITHIUM AND SODIUM UNDER PRESSURES UP TO 30,000 KG/CM2,
by Ye. G. Ponyatovskiy. 27 July 61, 4p. incl. illus. (Trans. no. MCL-1211 of Fizika Metallov i Metallovedeniye 11:476-477, 1961)
Unclassified report

DESCRIPTORS: High pressure research, *Lithium, *Sodium, Melting, Temperature, Thermochemistry, USSR, Alkali metals.

The melting point of Li(99.8%) and Na(99.9%) was measured in the pressure range from 1 to 30,000 kg/sq cm. The pressure was developed by compressing a mixture of isopentane with pentane in a superhigh pressure multiplier. The melting point was determined by the thermal analysis method with photographic recording of the cooling and heating curves of the specimen. The pressure was measured by a manganin manometer within an accuracy of + or - 100 kg/sq cm; the temperature was measured by an iron-nichrome thermocouple within an accuracy of + or - 1.5C. The melting point of Li and Na increased monotonically from 182 and 97.5 C, respectively, at atmospheric pressure to 234-248 C at a pressure of 30,000 kg/sq cm. (Author)

AD-261 849 Div. 25, 20, 2
(24 Aug 61) OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
PROTON LIFETIMES IN THE VAN ALLEN RADIATION BELTS,
by Harold Liemohn. June 61, 20p. incl. illus. (Document no. D1-82-0117)
Unclassified report

Also available from the author.

DESCRIPTORS: *Van Allen radiation belt, *Protons, Nuclear physics, Exosphere, Terrestrial magnetism, Particles, Scattering, Proton capture, *Nuclear reactions.

Several loss mechanisms limit the lifetimes of protons in the inner and outer Van Allen radiation belts. During geomagnetically quiet periods the principal mechanisms are believed to be charge exchange and coulomb scattering. Specific density models for the neutral and charged components of the background exosphere are employed in order to made an absolute comparison of these two mechanisms. It is shown that charge exchange is dominant for proton energies from 2 to 200 kev giving equatorial lifetimes of about one day in the outer belt. At higher energies the protons have lifetimes of the order of years from these loss mechanisms. The dependence of the lifetimes on the mirror latitude lambda sub m of the trapped protons is given approximately by cos to the 6th power lambda sub m. (Author)

AD-261 858 Div. 25
(5 Sep 61) OTS price $3.60

Brown U., Providence, R. I.
VIBRATIONS AND WAVE PROPAGATION IN ALUMINUM ALLOYS AT ELEVATED TEMPERATURES,
by S. R. Bodner and A. F. Fraser. Aug 61, 36p. incl. illus. tables.
(Contract Nonr-56220, Proj. NR 064-424)
Unclassified report

DESCRIPTORS: *Aluminum, *Aluminum allpys, Vibration, *Wave transmission, Frequency, Damping, High temperature research, Temperature, Stresses, Mechanical properties, Elasticity, Viscosity, Measurement, Rods, Tests.

Measurements of the dynamic modulus and damping of commercially pure Al (1100) and an Al alloy (2024-T4) were obtained over a frequency range of 20 to 3500 c at temperatures from 80 to 1100 F. For the small test oscillations the results were found to be amplitude independent. The frequency and temperature dependence of the results are discussed in relation to linear viscoelastic representations, metallurgical properties, and possible temperature-time correspondence. Pulse propagation tests were performed but their analysis is complicated by the amplitudes being sufficiently large to cause plastic waves at high temperatures. (Author)

AD-261 868 Div. 25, 8
(11 Sep 61) OTS price $2.60

Electron Device Lab., Ohio State U. Research Foundation, Columbus.
MEASUREMENT OF THICKNESS OF THIN FILMS.
Quarterly technical rept. no. 2, 1 Apr-30 June 61, on Diffusion of Impurities into Silicon Through an Oxide Layer,
by M. O. Thurston, T. E. Luke, and Joseph Tsai. 24 July 61, 22p. incl. illus. (Rept. no. RF 1233-20)
(Contract DA 36-039-sc-87426)
Unclassified report

DESCRIPTORS: *Silicon, Silicon compounds, Dioxides, Oxides, Chemical impurities, Diffusion, Solid state physics, Semiconductors, Films, *Thin films, Thickness, Measurements, Optical analysis, *Interferometers, Mathematical analysis, *Optics.

The general theory involved in the measurement of thin film thickness by interference methods is presented in this report. The work described follows that of S. Tolansky of London University whose publications on this subject are well known. The techniques used in obtaining the thickness measurements are described in detail and the interferograms resulting from this work are shown. As predicted by Tolansky, the interference method is a very powerful tool for accurate determination of thin film thicknesses. (Author)

AD-261 866 Div. 25, 4
(24 Aug 61) OTS price $5.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOME EQUILIBRIUM PROPERTIES OF ELEMENTAL SUPERCONDUCTORS,
by J. Fineman. 1 Aug 61, 54p. incl. illus. tables, 189 refs. (Rept. no. 46G-0013)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Superconductors, Magnetic fields, Specific heat, Temperature, Pressure, Isotopes, Chemical equilibrium, Thermodynamics, Physical properties, Chemical properties.

Research concerns a literature search on the equilibrium properties of superconductive elements. Data are included on critical temperature; on critical magnetic field and specific heat, their temperature and pressure dependence, and the associated parameters; and on the isotope effect. (Author)

AD-261 878 Div. 25
(24 Aug 61) OTS price $1.10

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
DIPOLE LATTICE SUMS FOR A RUTILE STRUCTURE,
by Bernard Smilowitz. 1958, 8p. incl. illus. tables.
(Contract AF 49(638)323)
(AFOSR TN 58-948)
Unclassified report

DESCRIPTORS: Oxides, *Titanium compounds, *Lattices, Crystals, *Crystal structure.

The dipole sums for a rutile structure with c/a = 0.67 and u parameter of 0.31 have been calculated and are presented in a summarized form. (Author)

AD-261 896 Div. 25
(24 Aug 61) OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
THE EFFECT OF THERMAL SPREAD ON THE TWO-STREAM RF GAIN FROM A NEUTRAL PLASMA BEAM,
by B. Hoeks. 21 Apr 61, 27p. incl. illus. tables
(Technical rept. no. 104-6)
(Contract AF 19(604)5480)
(AFCRL-370)
Unclassified report

DESCRIPTORS: *Plasma physics, Electromagnetic waves, Radiofrequency, *Radiofrequency amplifiers, Electrons, Ions, Excitation, *Plasma oscillation, *Magnetohydrodynamics, Mathematical analysis.

When ions and electrons are accelerated in the same direction to different velocities, RF signals will be amplified along this traveling plasma. Since the thermal velocity spread of the particles will make the imparted velocity difference less pronounced, one may expect to observe less gain than is predicted by the simple theory for cold streams. Calculations are presented here which show this reduction. Typically, the optimum gain goes down to two-thirds of the cold value when the random electron velocity is as little as 10% of the relative drift velocity. The plasma equations are linearized and it is assumed that (a) the plasma is electrically nearly neutral, (b) hydrogen ions are used, (c) the thermal ion velocity is small compared with the ion drift velocity, (d) the frequencies considered are relatively small, and (e) the electron drift velocity is only slightly larger than the ion drift velocity. Up to certain degrees of thermal spread the gain passes through a maximum as one varies the frequency. When the thermal spread increases, the frequency at which this optimum occurs decreases. The gain disappears completely when the above-mentioned thermal velocities become very large compared with the relative drift velocity. (Author)

AD-261 897 Div. 25
(24 Aug 61) OTS price $1.10

Stanford Electronics Labs., Stanford U., Calif.
THE FREQUENCY OF NONLINEAR PLASMA OSCILLATIONS,
by H. Derfler,. 10 May 61, 7p. incl. illus. (Technical rept. no. 104-7)
(Contract AF 19(604)5480)
(AFCRL-371)
Unclassified report

DESCRIPTORS: *Plasma oscillations, Nonlinear systems, Electrons, Ions, Velocity, Magnetic fields, *Plasma physics, *Magnetohydrodynamics, Mathematical analysis.

The frequency of plane standing waves of electrons moving through a background of infinitely heavy ions is strictly independent of amplitude as long as the electron velocity is a unique function of position. This result is contrary to those presented in recent publications by S. Amer, J. Electronics and Control, 5:105-113, 1958 and L. Gold, J. Electronics and Control, 6:548-549, 1959. The frequencies of spherical and cylindrical plasma oscillations, however, do depend upon the amplitude of the oscillation. As a result, any phase relationship between electrons eventually will be destroyed and the electron velocity becomes multivalued. Therefore steady free oscillations do not persist even in a cold plasma. (Author)

AD-261 898 Div. 25
(24 Aug 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
INSTABILITY OF ELECTRONS DRIFTING THROUGH IONS ACROSS A MAGNETIC FIELD,
by O. Buneman. 20 July 61, 15p. incl illus.
(Technical rept. no. 251-1)
(Contract AF 49(638)660)
(AFOSR-878) Unclassified report

DESCRIPTORS: *Electrons, *Ions, Magnetic fields, Transport properties, *Diffusion, *Plasma physics, *Magnetohydrodynamics, Drift, Mathematical analysis, Quantum mechanics.

It is shown that the drift motion of the electrons across the ions results in the usual two-stream instability and that the magnetic field, while reducing the growth rate to some extent, is unable to inhibit the instability effectively. The time scale is lengthened like B to the 1/3 power and not, as in collisional diffusion theory, like B squared. Typically, it can be predicted that if an electric field were applied to a plasma in a magnetic field, to reach its full value within a time rather less than an ion gyroperiod, the ions would never complete such a period; their interaction with the drifting electrons would have led to a state in which the ions and electrons shared their mean momentum. It is suggested that, in the case of shock or sheath models, the instability and resulting turbulence would account for the entropy change across the shock, while in PIG-type discharges it might account for the observed enhanced cross-field diffusi (Author)

AD-261 901 Div. 25, 15
(24 Aug 61) OTS price $1.10

Washington U., St. Louis, Mo.
AN ITERATION OF THE SCATTERING MATRIX IN FINITE TERMS,
by Kurt Haller. 1957, 10p.
(Contract AF 18(603)108)
(AFOSR TN 59-521) Unclassified report

DESCRIPTORS: *Quantum mechanics, *Operators (Mathematics), Matrix algebra, Integral equations, Functions, *Scattering, Particles, Mesons, Energy, Theory, Quantum statistics.

Computation of collision cross section in quantum field theory are performed by evaluating the T-matrix. The T-matrix is defined when the Hamiltonian can be separated into a free particle interaction. However the T-Matrix not being consistent with requirements for solution to free particle interaction is replaced by the R-Matrix. The R-Matrix was developed for the Hamiltonian on a free particle interaction. Results indicate that field theories can be classified into two varieties: one kind which gives rise to finite weak coupling iterative expansions and another kind which gives rise to infinities. Presumably these latter infinities are indicative of some more deep seated pathology in the field equations or in the approximation by which a non-relativistic Hamiltonian is obtained from a relativistic one. The gradient coupling theory, for example, gives rise to infinite R-Matrix elements, though these don't diverge as badly as the corresponding unrenormalized T-matrix elements evaluated by cut-off methods.

AD-261 920 Div. 25, 8
(25 Aug 61) OTS price $9.60

Michigan U., Ann Arbor.
STUDY OF A SEEDED PLASMA.
Doctoral thesis,
by Robert Sylvester Buchanan. 1961, 117p. incl. illus. tables, 50 refs.
(Contract AF 33(616)8126)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electrical properties, *Conductivity, Gas flow, Ionization, Gas ionization, Electrical properties, Microwaves, Dielectric properties, Alkali earths, Alkali metals, Discharge tubes, Aluminum.

The method of increasing the electrical conductivity of a gas (working fluid) by introducing a foreign element (seeding element) into the gas flow is studied, and the properties of the resulting plasma are determined. The alkali metals, alkaline earths, and aluminum which possess relatively low ionization potentials (3.8 to 7.6 electron volts) are considered as favorable seeding elements and analyzed. (Author)

AD-261 922 Div. 25
(25 Aug 61) OTS price $1.60

Oregon U., Eugene.
ON THE SUPERPOSITION OF PERIODIC POTENTIALS AND HOMOGENEOUS FIELDS,
by G. H. Wannier and D. R. Fredkin. 1960, 13p. (Technical rept. no. 1)
(Contract Nonr-277105, Proj. NR 017-633; In cooperation with Bell Telephone Labs., Murray Hill, N. J.)
Unclassified report

DESCRIPTORS: *Quantum mechanics, *Brillouin zones, *Crystals, *Lattices, Magnetic fields, Electric potential, Particles, Solid state physics, Electric fields, Mathematical analysis, Operators (Mathematics).

In connection with earlier work (Phys. Rev. 117:432, 1960), wave functions are constructed for a superposition of a periodic electric potential and a uniform magnetic field. The wave functions are not themselves solutions of the Schroedinger equation, but yield the traditional effective hamiltonian for this problem. Contrary to the electric field case the manifold of states linked by the band index does not form a Bloch band; the reason is that the cellular transforms of the Bloch-like functions are

modified by the Peierls phase. At present, the derivation of these results is in closed form, but justifiable only to all powers of the magnetic field. This was also the case for the previous electric derivation. The limitation may not be genuine. The second half of the paper does in fact prove directly the existence of closed Bloch bands in the presence of a homogeneous electric field; the case of free electrons is given as an example. One expects from this that the new results for the magnetic field are at least in part also independent of the power series method used for their justification. (Author)

AD-261 928 Div. 25, 15
(28 Aug 61) OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
BOUNDARY VALUE PROBLEMS IN THE THEORY OF ACOUSTIC WAVE FIELDS, PART I. EXISTENCE AND PROPERTIES OF A FUNDAMENTAL SOLUTION,
by Peter Werner. June 61, 37p. 15 ref. (MRC Technical summary rept. no. 233)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Acoustics, *Sound, Potential theory, Partial differential equations, Operators (Mathematics), Functional analysis, Integral equations.

AD-261 930 Div. 25, 15
(28 Aug 61) OTS price $4.60

Mathematics Research Center, U. of Wisconsin, Madison.
BOUNDARY VALUE PROBLEMS IN THE THEORY OF ACOUSTIC WAVE FIELDS. PART II. BOUNDARY VALUE PROBLEMS FOR THE REDUCED WAVE EQUATION WITH A VARIABLE COEFFICIENT,
by Peter Werner. June 61, 44p. 15 refs. (MRC Technical summary rept. no. 234)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Acoustics, *Sound, Potential theory, Partial differential equations, Operators (Mathematics), Functional analysis, Integral equations.

AD-261 969 Div. 25
(25 Aug 61) OTS price $1.60

Boeing Scientific Research Labs., Seattle, Wash.
HYDROMAGNETIC WAVES IN CERTAIN INHOMOGENEOUS MAGNETIC FIELDS,
by Ryszard Gajewski and Friedwart Winterberg.
June 61, 17p. (Rept. no. D1-82-0114)
(Contract AF 19(604)7287)
Unclassified report

Also available from the author.

DESCRIPTORS: *Magnetohydrodynamics, Magnetic fields, *Electromagnetic waves, *Propagation, Wave transmission, Equations, Fluid flow.

Propagation of hydromagnetic waves in a non-viscous, perfectly conducting, incompressible fluid is studied in a linear approximation, under the assumption of an unperturbed magnetic field $H_o = H_o(x)n$ where n is a constant unit vector. It is shown that there are two possible types of waves: (i) The generalized Alfven waves, propagating along the lines of force with a velocity $u = H_o/(4\pi\rho)1/2$ and differing from ordinary Alfven waves in that they may have a non-zero longitudinal velocity component; (ii) Waves analogous to the gravity waves which can, in general, propagate across the lines of force. In particular, it is shown that if u^2 = const. + a x , those waves travel in a direction perpendicular to n and to the x-axis with a group velocity $1/4\ a/\omega$ and a phase velocity $1/2\ a/\omega$. (Author)

AD-261 972 Div. 25, 22
(28 Aug 61) OTS price $1.60

Brown U., Providence, R. I.
AN EXPERIMENTAL STUDY OF STRESS WAVE PROPAGATION DUE TO IMPACT AT THE SURFACE OF A SEMI-INFINITE BODY.
Final rept.,
by J. H. Ludley and J. Duffy. 1961, 14p. incl. illus. (Rept. no. DA-4662/1)
(Contract DA 19-020-501-ORD-4662)
Unclassified report

DESCRIPTORS: *Impact shock, *Explosives, Detonation, *Elasticity, *Stresses, Photographic analysis, Deformation, *Solids, Tests, Experimental data, Propagation, *Detonation waves, Load distribution.

The present work was undertaken in connection with a study of detonation in explosives. It consisted of a photoelastic study of the development and propagation of stress and deformation in the neighborhood of an area of impact at the surface of a semi-infinite body. The intensity of a stress-wave in a body loaded by impact depends on the loading rate of the impact. In general, if a body is loaded mechanically, that is by collision with another body, only the quasi-static stress patterns will be of appreciable intensity. Very high loading rates, such as may be produced explosively, are required to produce stress-waves of an intensity such that they be visible photoelastically. (Author)

AD-261 981 Div. 25
(25 Aug 61) OTS price $11.00

Columbia U., New York.
INVESTIGATIONS IN THE MATHEMATICAL THEORY OF VIBRATIONS OF ANISOTROPIC BODIES.
Final rept. 1 July 60-30 June 61,
by R. D. Mindlin. 30 June 61, 143p. incl. illus. table, 98 refs. (Rept. no. CU-9-61-sc-87414-CE)
(Contract DA 36-039-sc-87414, DA Proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: *Vibration, *Dynamics, *Elasticity, Sheets, *Crystals, Stresses, *Quartz crystals, Deformation, Shear stresses, Electric fields, Piezoelectric materials, Differential equations, Integral equations, Determinants, Operators (Mathematics), Bessel functions, Functions, Piezoelectric effect.

This report includes:
VIBRATIONS OF AN INFINITE, MONOCLINIC, CRYSTAL PLATE AT HIGH FREQUENCIES AND LONG WAVE LENGTHS, by R. K. Kaul and R. D. Mindlin.

FREQUENCY SPECTRUM OF A MONOCLINIC CRYSTAL PLATE, by R. K. Kaul and R. D. Mindlin.

Division 25 - PHYSICS

STRONG RESONANCES OF RECTANGULAR AT-CUT QUARTZ PLATES, by R. D. Mindlin and D. C. Gazis. (In cooperation with General Motors Research Laboratories, Warren, Mich.).

FORCED VIBRATIONS OF PIEZOELECTRIC CRYSTAL PLATES, by H. F. Tiersten and R. D. Mindlin.

EXTENSIONAL VIBRATIONS OF THIN QUARTZ DISKS, by A. G. Lubowe and R. D. Mindlin.

STRESS FUNCTIONS FOR GENERALIZED PLANE STRESS IN ORTHOTROPIC PLATES, by Y. T. Huang and R. D. Mindlin.

AD-261 984 Div. 25, 17, 30
(25 Aug 61) OTS price $1.10

Institute for the Study of Metals, U. of Chicago, Ill.
(No title).
Final rept.,
by A. W. Lawson. Aug 61, 9p. 42 refs.
(Contract Nonr-212103)
Unclassified report

DESCRIPTORS: *High pressure research, *Solid state physics, Crystals, Crystal structure, Single crystals, X-ray diffraction analysis, High temperature research, Low temperature research, Metallic crystals, Diffusion, *Solids, Water, Earth, Thermal conductivity, Magnetic fields, Ultrasonics, Silver compounds, Bromides, Alkali metal compounds, Halides, *Semiconductors, *Laboratory equipment, *Bibliography.

The maintenance and construction of equipment for the generation of pressures up to 100 kilobars and its applications to physico-chemical problems of solid state physics were studied. The following apparatus was constructed and used: a Bureau of Standards modified Hall apparatus for pressures to 50 kb; high pressure apparatus for x-ray diffraction studies; a high pressure camera; a Griggs-Kennedy simple squeezer; an evaporating unit for deposition on electrode samples; and a spot welder. Forty-two publications were issued in connection with this contract; 3 publications are in preparation. The high-pressure allotropic modifications of such diverse systems as Fe, Bi, AgCl, KNO3, Teflon, CaCO3, and NaCl were studied by using the techniques developed on this project. Progress was made on the development of the elastic continuum model of diffusion in solids as a function of pressure.

AD-262 001 Div. 25, 20
(29 Aug 61) OTS price $9.10

Microwave Lab., Duke U., Durham, N. C.
REPORT NO. 33 TO PHYSICS DIVISION, AIR FORCE OFFICE OF SCIENTIFIC RESEARCH, 1 APRIL 1961 - 30 JUNE 1961.
30 June 61, 102p. incl. illus. tables, 100 refs.
(Contract AF 49(638)765)
Unclassified report

DESCRIPTORS: *Microwave spectroscopy, *Radiochemistry, *Radioactivation analysis, Proteins, Single crystal, Gamma rays, *Organic compounds, Nuclear spins, Free radicals.

This report includes:
Microwave Lab., Duke U., Durham, N. C.
ELECTRON SPIN RESONANCE INVESTIGATIONS OF THE PROTEINS, by Walter Gordy. 30 June 61, 10p. incl. illus. table.

Microwave Lab., Duke U., Durham, N. C.
ELECTRON SPIN RESONANCE OF AN IRRADIATED SINGLE CRYSTAL OF UREA OXALATE, by D.V.G.L. Narasimha Rao and Walter Gordy. 30 June 61, 19p. incl. illus. tables.

Microwave Lab., Duke U., Durham, N. C.
ESR SPECTRA OF A GAMMA-IRRADIATED SINGLE CRYSTAL OF DL-SERINE, by D.V.G.L. Narasimha Rao and Walter Gordy. 30 June 61, 6p. incl. table.

Microwave Lab., Duke U., Durham, N. C.
ASYMMETRY OF CYCLOTRON RESONANCE LINES IN THE REACTION ZONES OF LOW-PRESSURE ACETYLENE AND CYANOGEN FLAMES, by E. M. Bulewicz and P. J. Padley. 30 June 61, 8p. incl. table.

AD-262 005 Div. 25
(29 Aug 61) OTS price $1.25

Mount Vernon Research Co., Alexandria, Va.
SOLAR SPECTRUM SIMULATOR. SPACE ENVIRONMENT SIMULATOR FOR TESTING SOLAR CELLS.
Rept. for Jan-Sep 60 on Energy Conversion Technology,
by William W. Stickney. Nov 60, 31p. incl. illus. tables.
(Contract AF 33(616)6935, Proj. 3145)
(WADD TR 60-847) Unclassified report

DESCRIPTORS: *Solar cells, *Solar spectrum, Simulation, *Space environmental conditions, Thermal radiation, Plasma physics, Argon, Pressure, Vacuum switches, Tests, Test methods, Plasma jets, Optics, Quartz.

A device is to be developed which will simulate the space environment so that the performance in space of solar cells and arrays of them can be realistically evaluated in the laboratory. The environment includes three basic parameters: solar radiation, pressure, and thermal conditions. An argon stabilized, DC, plasma arc was developed as a light source to simulate the solar radiation in both color distribution and intensity from 0.2 to 2.0 microns wavelength. A vacuum chamber with liquid nitrogen cooled walls was built to simulate the effects on solar cells of pressure and thermal conditions in space. (Author)

AD-262 016 Div. 25
(29 Aug 61) OTS price $1.60

Paris U. (France).
STUDIES OF DISLOCATIONS IN METALS BY X-RAY METHODS.
Annual summary rept.,
by D. Taupin, C. Bousquet and others. 31 Mar 61, 19p. incl. illus.
(Contract AF 61(052)310)
(AFOSR-923) Unclassified report

DESCRIPTORS: Metals, *Metallic crystals, Crystals, Crystal structure, Lattices, Deformation, *X-ray diffraction analysis, Ferroelectric crystals, Elasticity, Barium compounds, *Titanates, Scattering, X rays, Reflection, Silicon, Theory, Equations, *Single crystals, Microstructure, Light, Microscopy.

Summaries are presented of investigations on (1) the influence of a dislocation upon the reflecting power of a perfect crystal (the theoretical results are in satisfactory agreement with experimental measurements); and (2) the Berg-Barrett method used to study the structures of the domains in a Ba Ti O3 crystal. The local distortion and the local value of the reticular spacing have been measured. (Author)

AD-262 018 Div. 25
(29 Aug 61) OTS price $8.60

Gordon McKay Lab. of Applied Science, Harvard U. Cambridge, Mass.
PRESSURE DEPENDENCE OF MAGNETOCONDUCTANCE IN N-TYPE GERMANIUM,
by Webster E. Howard, Jr. 10 Mar 61, 82p. incl. illus. tables (Technical rept. HP-7)
(Contract Nonr-186610)
Unclassified report

DESCRIPTORS: *Pressure, *Solid state physics, *Germanium, Brillouin zones, *Magnetic properties, Magnetism, Temperature, Transport properties, Electrical effects, Resistance.

Magnetoconductance measurements to pressures of 20,000 kg/sq cm on n-type germanium are discussed. The measurements confirm the ideas and numerical results of Nathan, Paul, and Brooks (Phys. Rev. to be published). For the energy separation, the following relation is obtained: delta E (ev) equals .21 + or - .03 - (6.5 + or - 1.0)x 10 to the -6th power P(kg/sq cm). After deducing the pressure dependence of the electron mobility in the absence of the second set of states, it is confirmed that there is appreciable interband scattering at high pressures in n-type Ge. It is established that the anisotropy parameter K is relatively insensitive to pressure, decreasing by only a few percent in 20,000 kg/sq cm. Then the observed magnetoconductance anisotropy is correlated at atmospheric pressure with the relative amount of impurity scattering present by analyzing the effect of impurity scattering on the transport integrals. In this way conclusions are drawn which relate to the limit of pure lattice scattering. (Author)

AD-262 026 Div. 25, 30, 4
(29 Aug 61) OTS price $3.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
MICROWAVE RESPONSE OF ETHANOL AND BROMOETHANE AND ITS PRESSURE DEPENDENCE,
by Eldred B. Littlefield. July 61, 31p. incl. illus. tables, 35 refs. (Technical rept. no. 165)
(Contract Nonr-184110)
Unclassified report

DESCRIPTORS: *Ethanols, *Ethanes, Bromides, *Liquids, *Dielectrics, Dielectric properties, Microwave frequency, Pressure, Relaxation time, Solutions, Cyclohexanes, Organic solvents, High pressure research, Klystrons, Test equipment, Temperature, Theory, Chemical bonds, Hydrogen, *Laboratory equipment, Electric insulation.

Equipment has been designed for measuring the dielectric constant and loss of high-loss liquids from 3 x 10 to the 8th power to 5 x 10 to the 9th power cps at pressures up to 1000 atm. Bromoethane showed a pressure sensitivity for dielectric relaxation delta log pi/atm, about 5 times that of ethanol. This suggested that the relative insensitivity of ethanol is due to its H-bonded structure. Solutions of ethanol in cyclohexane, down to 25 mole % ethanol, show a maximum in relaxation time near equimolar composition. This behavior is contrary to the prediction of the usual Debye theory, since the viscosity of the solution decreases monotonically in this composition range on dilution with cyclohexane. (Author)

AD-262 027 Div. 25, 30
(29 Aug 61) OTS price $1.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
MAGNETIC METHOD FOR THE DETERMINATION OF THE ANISOTROPY DISTRIBUTION IN FERROMAGNETIC POWDERS. FIL interim rept.,
by P. J. Flanders and S. Shtrikman. Aug 61, 16p. incl. illus. 14 refs. (Rept. no. I-A2026-3)
(Contract AF 49(638)159)
(AFOSR-984)
Unclassified report

DESCRIPTORS: *Ferromagnetic materials, Test methods, Physical properties, Determination, Magnetism, Torque, Measurement, Magnetic fields, Magnetometers, Powders, Particles.

A technique to determine the anisotropy distribution in a ferromagnetic powder consisting of uniaxial particles has been developed which can be used for samples with randomly oriented particles as well as with oriented samples. In principle it eliminates incoherent magnetization reversals. It involves saturating the material in a magnetic field and then making torque measurements at an angle several degrees away from the saturating direction. In these measurements the torque on the specimen as a function of magnetic field is recorded as the field is cycled from zero to a specified field and then reduced to zero. This cycling procedure is continued, gradually increasing the maximum applied field upon subsequent cycles until the magnetic field exceeds the highest anisotropy field of the particles in the distribution. For elongated gamma-Fe203 particles this technique gives length to width distributions which approach those observed by the electron microscope technique. (Author)

AD-262 033 Div. 25, 8
(30 Aug 61) OTS price $1.60

Hebrew U. (Israel).
HYPERFINE INTERACTIONS IN THE GROUND STATE AND FIRST EXCITED STATE OF DY161 IN DYSPROSIUM IRON GARNET,
by R. Bauminger, S. G. Cohen and others. May 61, 16p. incl. illus. tables, 12 refs. (Technical note no. 4)
(Contract AF 61(052)347)
(AFOSR-987)
Unclassified report

DESCRIPTORS: *Dysprosium, *Hyperfine structure, Nuclear states, Excitation, Magnetic moments, Magnetic fields, Quadrupole moments, Temperature, Iron compounds, Garnet, Absorption, Electron transitions, Measurement.

The hyperfine Zeeman splittings in the recoil-free absorption spectrum of the 26 kev gamma ray from Dy-161m in Dy-161 situated in dysprosium iron garnet have been observed. At 85 K, the magnetic hyperfine interactions of the ground state and first excited state of Dy-161 are -400 + or - 40 mc and 455 + or - 40 mc, respectively. The electric quadrupole interactions (eqQ/4) at this temperature are 120 + or - 30 and 90 + or - 30 mc, respectively. At 300 degrees K the effective magnetic field (H sub eff) is 4.6 times smaller, and illustrates the proportionality between H sub eff and spontaneous magnetization of the Dy sub-lattice. Assuming Parks value of -0.37 + or - 0.05 nm for the Dy-161 ground state magnetic moment, H sub eff (85 K) equals 3.5 x 10 to the 6th power oe, and 0.42 + or - 0.08 nm for the magnetic moment of the first excited state were obtained. At 300 K a quadrupole interaction of less than 20 mc was obtained.

The strongly temperature dependent quadrupole interaction is interpreted as being largely due to the effective electric field gradient produced at the nucleus by the 4f electrons which should be partially aligned below the Curie temperature. (Author)

AD-262 038 Div. 25
(25 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
THE FLUX AND ENERGY SPECTRA OF THE PROTONS IN THE INNER VAN ALLEN BELT,
by John E. Naugle and Donald A. Kniffen. Aug 61, 6p. incl. illus. table (Technical note no. D-412)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-412.

DESCRIPTORS: *Van Allen radiation belt, Measurement, Rocket trajectories, Protons, Particles.

A cylindrical stack of G-5 nuclear emulsions housed in the payload section of a four-stage research rocket was flown into the northern edge of the inner Van Allen belt on September 19, 1960. The experimental design permitted, for the first time, measurements of the particle fluxes and energy spectra as functions of position along the rocket trajectory. Eight points along the trajectory have been selected for analysis. Results are presented herein for three of these points, and they are discussed in the light of various theories on the trapped radiation. (Author)

AD-262 048 Div. 25, 10
(28 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
HEAT TRANSFER TO AN ELECTRICALLY CONDUCTING FLUID FLOWING IN A CHANNEL WITH A TRANSVERSE MAGNETIC FIELD,
by Morris Perlmutter and Robert Siegel. Aug 61, 41p. incl. illus. tables (Technical note no. D-875)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-875.

DESCRIPTORS: Convection, *Heat transfer, Liquids, *Fluid flow, Magnetic fields, Electric currents, Magnetohydrodynamics, Fluid mechanics, Metal plates, Electrical conductance.

An analysis is made for forced-convection heat transfer to laminar flow of an incompressible electrically conducting fluid between parallel plates. The plates are heated (or cooled) with a uniform wall heat flux, and internal heating within the fluid is present from viscous and electrical dissipations. The fluid enters the heated section of the channel with a uniform temperature, and the velocity distribution within the heated section is assumed to be fully developed. A magnetic field is imposed perpendicular to the channel walls, and there can be a net electric current flow parallel to the walls and perpendicular to the flow direction. The results give the wall temperatures that will be present for various magnetic fields and electric current flows and the duct length required to obtain a fully developed temperature distribution in the fluid. (Author)

AD-262 051 Div. 25
(11 Sep 61) OTS price $4.60

Naval Ordnance Lab., White Oak, Md.
RADIATION DAMAGE THRESHOLDS FOR PERMANENT MAGNETS,
by R. S. Sery, R. H. Lundsten, and D. I. Gordon. 18 May 61, 35p. incl. illus. tables (Rept. no. NOLTR 61-45)
Unclassified report

DESCRIPTORS: *Radiation damage, *Magnets, *Neutron flux density, Radiation effects, Magnetic fields.

Permanent magnets were irradiated to integrated neutron flux levels from 3.0 x 10 to the 17th to 4.0 x 10 to the 20th power epicadmium n/sq cm. In spite of this relatively high dose, Alnicos II, V and XII showed negligible change in properties whether irradiated at 60 C, 235 C, or 325 C. Cunico I, though affected, showed changes less than a threshold of radiation damage of + or - 10%. Cunife I and 3-1/2 Chromium Steel showed slight improvements in properties. The Barium Ferrites, Silmanal, 36 Cobalt Steel and others exceeded the 10% damage threshold by various amounts which extended up to severe demagnetization. Differentiation between temperature and radiation effects was accomplished by the use of control magnets, and by the 60 C irradiation. Limitations on the use of Alnicos II, V, XII and Cunico I in combined heat and nuclear radiation environments may be imposed by the higher vulnerability of associated soft magnetic circuit components, e.g., pole pieces of soft iron, to radiation damage and by high gamma heating which can occur if a magnetic circuit must be used in a sealed container (for protection from corrosion or other reasons). The Alnicos exhibit the highest resistance to radiation, while the barium ferrites show the least. (Author)

AD-262 053 Div. 25, 27, 12
(29 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
FAR-FIELD NOISE CHARACTERISTICS OF SATURN STATIC TESTS,
by Wade D. Dorland. Aug 61, 48p. incl. illus. tables (Technical note no. D-611)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-611.

DESCRIPTORS: Guided missiles, *Rocket motors, Tests, *Noise, Noise analyzers.

A far-field survey has been conducted to determine the characteristics of the noise generated by the Saturn static firing tests. Data obtained for the first series of eight tests indicate the noise has high power, broad directivity, a low frequency spectrum, and low efficiency. Initial tests were made firing two engines on the first test and four engines on the second test. These tests produced sound power levels of 0.56 megawatt and 1.6 megawatts, respectively, with low efficiencies of 0.047% and 0.06%. The remaining six tests were made with eight engines. They produced sound power levels ranging from 25 megawatts to 40 megawatts, with an acoustic efficiency of approximately 0.7%. Frequency spectra peaked between 10 cps and 100 cps, with a severe dip at 250 cps and a minor peak at 1000 cps. The effects of impingement on the flame deflector and the dampening of the cooling water make it very difficult to isolate the effects of clustering the engines. (Author)

AD-262 060 Div. 25, 17, 4 *
(29 Aug 61) OTS price $1.25

Nuclear Metals, Inc., Cambridge, Mass.
THERMODYNAMICS OF THE INTERACTION OF NIOBIUM AND TANTALUM WITH OXYGEN AND NITROGEN AT TEMPERATURES NEAR THE MELTING POINT.
Rept. for 15 June 59-14 June 60, on Experimental Techniques for Materials Research,
by J. Paul Pemsler. Mar 61, 38p. incl. illus. tables, 12 refs.
(Contract AF 33(616)6627, Proj. 7364)
(WADD TR 60-655) Unclassified report

DESCRIPTORS: *Niobium, *Tantalum, Oxygen, Nitrogen, Thermodynamics, Thermochemistry, Phase studies, Metals, Gases, Solubility, Dissociation, Melting, Chemical analysis, Solids, Thermionic emission, Measurement, Chemical reactions, High temperature research, Heat of reaction, Enthalpy, Entropy.

The concentration of N and O present in Nb and Ta in equilibrium with the pure gas has been determined as a function of pressure at each of 3 temperatures near the melting point, and in the liquid phase at the melting point. The solubility of N in Nb is directly proportional to the square root of the pressure (Sievert's Law) up to the solubility limit, where the saturated solution is in equilibrium with Nb2N. The solubility of N in Ta shows a negative deviation from Sievert's Law at N concentrations above 5 at-%; beyond the solubility limit saturated solution is converted to Ta2N. The Nb-O and Ta-O systems obey Sievert's Law up to the solidus point. The temperatures investigated were above the melting points of the metal oxides and no oxide scales were obtained. A curious solubility inversion was noted in the Ta-O system where the O concentration in equilibrium with a specified pressure of O is lower at 2850 than at 2960 C. It was shown that the concentration of H in equilibrium with metal at high temperature is very low. (Author)

AD-262 073 Div. 25, 20
(30 Aug 61) OTS price $2.60

Paris U. (France).
INVESTIGATION OF RECOMBINATION RADIATIONS FROM SEMICONDUCTORS,
by C. Benoit A La Guillaume. 15 May 61, 21p. incl. illus. tables.
(Contract AF 61(052)370)
(AFOSR-1042) Unclassified report

DESCRIPTORS: Recombination reactions, *Semiconductors, Germanium, Impurities, Chemical impurities, Electron transitions, Spectrographic analysis, Test equipment, Magnetic fields, Interferometers, Integral transforms, Annihilation radiation, Magneto-optic rotation.

Recombination radiations from semi-conductors, mainly Germanium, were studied at low temperature (2 K to 20 K) with a resolving power of 1000 to 3000. A careful study of the intrinsic lines in Ge including magneto-optical effects proved that, at low temperature, they are due to exciton annihilation, and that the minimum of the conduction band is exactly at the edge of the Brillouin zone in the direction. Lines due to shallow impurities in Ge were studied. Two types of transition are observed: (1) recombination of a free carrier with a carrier of opposite sign bounded to the impurity, and (2) annihilation of an exciton from a 4 particles complex involving a neutral impurity plus an exciton. In both cases, first order and second order transition are observed, and one can deduce the value of the k equals o component of the wave function of the electron bounded to donors. Some results were obtained in an attempt to visualize the dislocations in Ge by their own recombination radiation. (Author)

AD-262 088 Div. 25, 8
(29 Aug 61) OTS price $2.60

University Coll. of North Staffordshire (Gt. Brit.).
ZERO FIELD SPLITTINGS OF DIFFERENT IRON COMPLEXES.
Annual technical status rept. no. 1, 1 Aug 60-31 Aug 61.
31 July 61, 29p. incl. illus. 16 refs.
(Contract DA 91-591-EUC-1498)
Unclassified report

DESCRIPTORS: *Paramagnetic crystals, Yttrium, Gallium, Garnet, Beryllium compounds, Sapphires, *Iron compounds, Ions, *Complex compounds, *Microwave spectroscopy, Helixes, Magnetic fields, *Masers, *Spectrophotometers, Modulation, Cavity resonators, Resonance absorption, X band, Microwave networks, Crystal detectors, Lattices, Electron transitions, Microwave amplifiers, Frequency modulation.

The experimental and theoretical requirements for an analysis of crystal field splittings are indicated. The experimental technique requires a microwave spectrometer which is capable of a large frequency sweep. Theoretical calculations when compared to the results of direct zero field absorption have shown that extrapolation methods give a discrepancy larger than that estimated from experimental error. The frequency dependence of microwave components has led to the development of a coaxial system to work over the whole of the X band frequency range. The sensitivity of the equipment in terms of the spins detectable is lower than that of a fixed frequency spectrometer employing a high Q cavity. A frequency modulation system was constructed to give high sensitivity to the electronic detection equipment. A low frequency system was also arranged to enable the signal to be displayed on a video system. Frequency sweeps of 2 and 2.5 gc were achieved and the resonance condition continuously satisfied for a sample of D.P.P.H., over these ranges. A swept dc magnetic field was used to split the states of this sample. (Author)

AD-262 092 Div. 25, 15
(29 Aug 61) OTS price $5.60

Weizmann Inst. (Israel).
LINEAR RESPONSE FUNCTION OF A MANY FERMION SYSTEM,
by Arnold J. Glick. 1 May 61, 66p. incl. illus. 27 refs. (Technical note no. 10)
(Contract AF 61(052)337)
(AFOSR-1163) Unclassified report

DESCRIPTORS: *Quantum statistics, *Particles, *Perturbation theory, Green's function, Operators (Mathematics), Functions, Integral transforms, Integral equations, Series.

The properties of a many body system are studied by means of a linear response function which depends on frequency and wave number. It is shown

how the expectation value of two body operators, the rate of transitions induced by one body operators or weak external fields acting on the system, and information about the energy spectrum can be found from this function. As a result, the formalism suggests many relationships between apparently dissimilar quantities, and suggests indirect ways of experimentally measuring internal properties of a system. In the present formalism, all of the difficulties inherent in many body calculations are related to the determination of the response function. However, there exist some rules and a priori conditions on this function which can be used to estimate the validity of approximate calculations and to indicate what must be done to improve the results. The response function is calculated for a Fermi gas by using a combined diagrammatic perturbation theory and Green's function technique. (Author)

AD-262 093 Div. 25, 15
(30 Aug 61) OTS price $3.60

Weizmann Inst. (Israel).
THE ANALYTIC STRUCTURE OF MANY BODY PERTURBATION THEORY,
by Amnon Katz. 10 May 61, 33p. incl. illus.
(Technical note no. 11)
(Contract AF 61(052)337)
(AFOSR-1164) Unclassified report

DESCRIPTORS: *Perturbation theory, Differential equations, Taylor's series, Energy, Volume, *Physics, Superconductivity, Matrix algebra, Integral equations, Spheres, Particles, Series, Sequences, *Algebraic topology, Algebras, *Quantum statistics, Scattering.

The Goldstone linked cluster expansion is used to determine the energy as an analytic function of the coupling constant. This function is many valued and describes the various energy levels of the system. The energy of each level can be obtained from the Goldstone expansion by continuing it analytically along a properly chosen path in the complex plane. The Brueckner ladder approximation is shown to be an approximation to an analytic continuation along a path which always leads to the normal state - the state in which no binding occurs. (Author)

AD-262 100 Div. 25
(29 Aug 61) OTS price $18.50

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
THE USE OF THE SHOCK TUBE AS A SPECTROSCOPIC SOURCE WITH AN APPLICATION TO THE MEASUREMENT OF gf-VALUES FOR LINES OF NEUTRAL AND SINGLY IONIZED CHROMIUM,
Doctoral thesis.
by T. Wilkerson and O. Laporte. June 61, 282p. incl. illus. tables, 121 refs. (Rept. no. 02822-3-T)
(Contract AF 49(638)439)
(AFOSR-1151) Unclassified report

DESCRIPTORS: *Shock waves, *Molecular spectroscopy, *Atomic spectrum, *Chromium, Ions, High temperature research, Shock tubes, Carbonyl radicals, Gases.

With chromium carbonyl as the additive, the gas behind the reflected shock emitted intense lines of neutral and singly ionized chromium (CrI and CrII). Line intensities were measured by heterochromatic photometry, using the anode crater of a carbon arc as the primary radiation standard. The state of the gas was computed from shock tube theory, taking account of dissociation, ionization, and excitation. Computed atomic populations were used, in conjunction with the theory of radiative transfer, to derive absolute gf-values of the lines from their observed intensities. The measurements covered twenty lines of CrI and eight lines of CrII in the wavelength region 4500-5000 A. The relative magnitudes of the CrI gf-values were quite different from the relative values previously found in a furnace ex riment. The new values rectify the anomalies att.ibuted to CrI in arcs and the sun on the basis of the previous work. The results of other experiments are compared to a few of the new absolute gf-values of CrI. The new values are three to five times greater. The gf-values for CrII are apparently the first to be measured for this ion. Observations were made of the ionization relaxation of CrI immediately behind the reflected shock. (Author)

AD-262 101 Div. 25
(29 Aug 61) OTS price $6.60

Microwave Lab., Stanford U., Calif.
STATISTICAL MECHANICAL BASIS FOR THE SECOND LAW OF THERMODYNAMICS,
by R. A. Nelson. Apr 61, 58p. incl. illus. 22 refs. (ML rept. no. 805)
(Contract AF 49(638)342)
(AFOSR-630) Unclassified report

DESCRIPTORS: *Thermodynamics, Magnetic fields, Matrix algebra, Integral equations, Theory, Statistical functions, Measure theory, *Quantum statistics, *Algebraic topology, Entropy, *Mechanics.

Work is conducted which shows that irreversible macroscopic behavior can result from reversible microscopic mechanics or, more specifically, how the second law of thermodynamics can be a consequence of the Schrodinger equation. (Author)

AD-262 113 Div. 25, 4
(30 Aug 61) OTS price $3.60

Copenhagen U. (Denmark).
THE DETERMINATION OF THE STRUCTURE OF ALPHA- AND BETA-FLUORONAPHTHALENES AND OTHER SELECTED MOLECULES BY INFRARED AND MICROWAVE TECHNIQUES. Final rept. 1 Sep 58-30 Apr 61, on Microwave Spectroscopical Investigations,
by Borge Bak. 25 May 61, 38p. incl. tables, 32 refs.
(Contract AF 61(052)73)
(AFOSR-1035) Unclassified report

DESCRIPTORS: *Naphthalenes, *Fluorides, Molecular structure, Determination, Microwave spectroscopy, Infrared spectroscopy, *Furan, *Thiophenes, *Benzonitriles, Ethyl radicals, Molecules.

Contents:
The mono-fluoronaphthalenes
The attempted analyses of the spectrum of alpha-fluoronaphthalene
The microwave spectrum of beta-fluoronaphthalene
Ethyl fluoride
Thiophene
Benzonitrile
Furan
Molecular structure correlations

AD-262 128 Div. 25
(28 Aug 61) OTS price $5.60

Hughes Aircraft Co., Culver City, Calif.
STUDY OF MAGNETOHYDRODYNAMIC WAVES.
Final rept.,
by H. H. C. Chang. 12 July 61, 61p. incl. illus. 52 refs.
(Contract AF 19(604)7372)
(AFCRL-566)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Ionosphere, *Electromagnetic waves, Low frequency, Propagation, Reflection, Transmission, Plasma physics, Velocity, Vector analysis.

The propagation of magnetohydrodynamic waves obliquely incident in a horizontally stratified ionosphere is discussed. The equations are cast in the coupled form suitable for computation by means of a high-speed modern computer, but no numerical results are obtained because of the prohibitive amount of work necessary to solve the equations in the case of oblique incidence and in the nongeometrical optics limit. (Author)

AD-262 132 Div. 25, 17
(29 Aug 61) OTS price $2.00

Technische Hochschule, Munich (Germany).
RESEARCH ON THE DISTRIBUTION OF TENSION IN NOTCHED CONSTRUCTION PARTS.
Rept. for Dec 56-Jan 59 on Materials Analysis and Evaluation Techniques,
by H. Neuber. Jan 61, 66p. incl. illus. table.
(Contract AF 61(514)1111, Proj. 7360)
(WADD TR 60-906) Unclassified report

DESCRIPTORS: *Mechanics, Steel, Aluminum, Aluminum alloys, Tensile properties, Stresses, Deformation, Elasticity, Plasticity, Shear stresses, Rods, Tests, Theory, Test methods, Test equipment, Strain gages, Photoelastic materials, Measurement, Mathematical analysis, Plastic coatings, Epoxy resins, *Applied mechanics, Germany, *Test facilities, Photoelasticity.

The influence of various factors (notch-radius, depth of notch, notch-angle, material) on the stress concentration of notched flat bars was investigated theoretically and experimentally by electrical strain gages and by means of the photoelastic stress-coat method. The elastic stress-concentration factors (SCF), and the stress distribution over the minimum cross section were evaluated theoretically and experimentally for the elastic range. For the plastic range a method was developed that considered the real stress-strain curve of the material. This method allows the calculation of the stress concentration factor (which is known to decrease with increasing load) in dependence of the nominal stress in tension and bending. The method was applied to evaluate the diagrams for 4 different materials (steel St. 00.12, St 00.21, pure Al, and Al alloy, Velodur), which show the SCF vs the nominal stress. Numerous tests with notched specimens of these materials confirm the theory. In these tests in the plastic range the strain distribution over the minimum cross section was also determined. Further theoretical investigations concern the treatment of V-shaped notches and the influence of the notch-angle in pure shear. (Author)

AD-262 178 Div. 25
(30 Aug 61) OTS price $1.60

National Electrotechnical Inst. (Italy).
ELECTRON MICROSCOPE INVESTIGATION ON THE NATURE OF TRACKS OF FISSION PRODUCTS IN MICA.
by G. Bonfiglioli, A. Ferro, and A. Mojoni.
May 61, 12p. illus. table (Technical note no. 3)
(Contract AF 61(052 328
(AFOSR-981) Unclassified report

DESCRINTORS: *Electron microscopes, *Mica, Italy, *Fission products, Crystals, Radiation damage, Fast neutrons, Neutron bombardment, Metals, Crystal structure.

Specimens of different micas were examined by the electron microscope, after suitable bombardment to clarify some aspects of the damage caused to crystals by fission products. Biotite, muscovite, artificial fluorophlogopite and muscovite annealed at 900 C (i.e. above the point of loss of crystallization water) were observed after covering with a thin evaporated uranium layer and irradiation in a reactor up to an integrated flux of 10 to the 15th power thermal neutrons/sq. cm. Tracks appeared on every specimen but biotite; the tracks being larger in muscovite (240 angstrom, thinner in fluorophlogopite (150 angstrom and still more in dehydrated muscovite (115 angstrom). No tracks were observed in biotite, likely because of too rapid recovery effects. Recovery effects were,observable in muscovite. No recovery effects were observed in fluorophlogopite nor in dehydrated muscovite. (Author)

AD-262 192 Div. 25, 5, 8
(30 Aug 61) OTS price $19.75

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
(No title).
Quarterly progress rept. no. 62, 15 July 61,
by H. J. Zimmermann, G. G. Harvey and W. B. Davenport, Jr. 15 July 61, 303p. incl. illus. tables.
(Contract DA 36-039-sc-78108)
Unclassified report

DESCRIPTORS: Diodes, Electron tubes, Germanium, Thermionic emission, *Plasma physics, Magnetohydrodynamics, Magnetic fields, Gas ionization, Low temperature research, *Microwave spectroscopy, Hyperfine structure, Nuclear magnetic resonance, Microwaves, Molecular beams, Communications theory, Data transmission systems, Data processing systems, Voice communication systems, Speech transmission, Machine translation, Nonlinear systems, Language, Neurology, Thin films, Magneto-optic rotation, Ferromagnetic materials, Metal films, *Electronics, Ionization gages, Waveguides, Statistical functions, Masers, Phonons.

AD-262 194 Div. 25
(30 Aug 61) OTS price $3.60

Israel Inst. of Tech., Haifa.
BUCKLING OF CIRCULAR CONICAL SHELLS UNDER AXISYMMETRIC EXTERNAL PRESSURE,
by Josef Singer. Nov 60, 35p. incl. illus. tables, 13 refs. (Technical note no. 1)
(Contract AF 61(052)339)
(AFOSR TN 60-711) Unclassified report

DESCRIPTORS: Structural shells, *Conical bodies, Buckling, Deformation, Hydrostatic pressure, Mathematical analysis, Equations, Stability, Stresses, Elasticity, Moments, Pressure.

The stability equations for thin conical shells derived by Seide (J. Appl. Mechanics, 24, No. 4, 547; Dec 1957) are solved for loading under hydrostatic pressure and lateral pressure varying in the axial direction. The solution implies slightly relaxed boundary conditions for the u and v displacements, but for the w displacements the usual conditions of simple supports are enforced rigorously. The stability equation in the radial direction is rederived in a modified form similar to that given by Batdorf (NACA Report 874, 1947) for cylindrical shells and is solved by the Galerkin method. Results for the case of hydrostatic pressure are compared with those obtained by Hoff (AFDSR TR (Final) 59-203, Dec 1959) in an analysis restricted to small cone angles, and with the results found by other investigators. (Author)

AD-262 203 Div. 25
(30 Aug 61) OTS price $1.60

Watertown Arsenal Labs., Mass.
A MODEL FOR THE EFFECT OF THICKNESS ON FRACTURE TOUGHNESS,
by Joseph I. Bluhm. July 61, 17p. incl. illus.
(Rept. no. WAL TR 834.2/4)
Unclassified report

DESCRIPTORS: *Fracture (Mechanics), Sheets, Thickness, Shear stresses, *Plasticity, Mathematical analysis, Surface properties, Theory.

A simple model of the fracture phenomenon in sheet is suggested based essentially upon the assumption that the shear lip formation is a volume sensitive mechanism whereas flat fracture is essentially a surface phenomenon. A critical shear lip width is hypothesized; this concept is substantiated and is shown to lead to the variations in shear lip width with thicknesses that are experimentally observed. Furthermore, the fracture toughness-thickness relationship constructed by the simple linear superposition of the above two fracture mechanisms predicts identically the observed fracture toughness. A numerical illustration indicates the use of test results to calculate the G sub c versus t curve for a given temperature over the entire range of thicknesses. (Author)

AD-262 205 Div. 25, 17
(30 Aug 61) OTS price $1.10

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Cr3B4,
by Mats Elfstrom. 21 June 61, 5p. incl. tables.
(Technical note no. 25)
(Contract AF 61(052)40)
(AFOSR-691) Unclassified report

DESCRIPTORS: *Chromium alloys, *Boron alloys, *Crystal structure, X-ray diffraction analysis, Alloys, Preparation, Measurement, Test methods, Crystals, Borides, Chromium compounds.

Lattice parameters, atomic parameters, and interatomic distances of Cr3B4 alloy were investigated. The results of lattice parameter determinations agree with those of Anderson and Kiessling (Acta Chem. Scand. 4:160, 1950). The space group Immm derived by Kiessling in the study of TaB4 was confirmed. The difference between the two shortest non-equivalent boron-boron distances was not significant. Thus, Cr3B4 has no abnormally short boron-boron distances as was suggested by Kiessling.

AD-262 208 Div. 25
(31 Aug 61) OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
BEAM POWER DEVELOPMENT IN A PLASMA,
by J. E. Drummond. July 61, 26p. (Document no. D1-82-0125)
Unclassified report

Also available from the author.

DESCRIPTORS: *Plasma physics, *Electric fields, Functions, *Electron beams, Modulation, Integral equations, Conductivity, Penetration, Density, Excitation, Damping, Oscillation, Magnetic fields, Electromagnetic waves, Fourier analysis, Series, Energy, Integral transforms, Tests, Power.

The form of electric field eigenfunctions are derived which extremize the power delivered by a finite beam to the field, and these power modes are related to an instability generated by two finite beams interpenetrating a homogeneous warm plasma. Any electric field orthogonal to the (incomplete) set of these eigenfunctions produces zero power from the beam. (Author)

AD-262 215 Div. 25, 8, 4
(30 Aug 61) OTS price $4.60

Battelle Memorial Inst., Columbus, Ohio.
STUDY OF SEMICONDUCTING PROPERTIES OF RARE-EARTH METALS AND COMPOUNDS.
Interim scientific rept. no. 2, 31 Oct 60-1 June 61,
by J. F. Miller, L. K. Matson, and others.
21 Aug 61, 49p. incl. illus. tables.
(Contract AF 33(616)7321)
Unclassified report

DESCRIPTORS: *Semiconductors, *Rare earth elements, *Selenides, *Tellurides, *Gadolinium compounds, Phase studies, Crystal structure, Lattices, Intermetallic compounds, Single crystals, Crystallization, Preparation, Purification, Zone melting, Resistance, Electrical properties, Hall effect, Physical properties, Low temperature research, High temperature research, *Rare earth compounds, Chemical analysis, X-ray diffraction analysis, *Neodymium compounds.

Four binary crystalline phases of the Gd-Te system were identified: GdTe, a phase which persists over the Gd3Te4-Gd2Te3 range, GdTe2, and GdTe4. Two phases have been prepared and studied in the Nd-Te system: NdTe and a phase encompassing the Nd3Te4-Nd2Te3 composition range. In both the Gd-Te and Nd-Te systems, room temperature electrical resistivities and Seebeck coefficients typically increased as the Te-M ratio was increased from 1 to 1.33 to 1.5. Resistivities of all n-type specimens studied increased

with temperature (80 to 800 K). Twelve new compositions, including selenides and tellurides of Sm, Yb, Ce, and Gd were prepared. Crystal structures and lattice constants obtained for 11 of the compounds show that generally the MX compositions have the NaCl structure and the M2X3 compositions have the bcc Th_3P_4-type structure. Trends in the electrical properties follow a pattern appearing to correlate with the M-X ratio and the stable valence states of the rare-earth elements. (Author)

AD-262 240 Div. 25, 8
(15 Sep 61) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE HIGH FREQUENCY LOW PRESSURE DISCHARGE,
by Herbert S. Bennett. 24 Aug 61, 35p. (Rept. no. 46G-0006)
(Contract AF 19(604)7400)
(ARPA Order no. 85-61) Unclassified report

DESCRIPTORS: *Microwaves, High frequency, *Electric discharges, Gas discharges, Secondary emission, *Electronic switches, Space charges, Electrons, Electric fields, Ionization.

The growth, maintenance, and extinction are considered of the discharge phenomenon connected with high frequency, low pressure discharge. A better understanding of the role played by space charge effects during the history of the discharge is sought. (Author)

AD-262 261 Div. 25, 17
(18 Sep 61) OTS price $3.60

Naval Research Lab., Washington, D. C.
THE EFFECTS OF IRRADIATION ON MAGNETIC PROPERTIES OF ALLOYS AND FERRITES,
by A. I. Schindler. 11 Aug 61, 37p. incl. illus. tables, 11 refs. (NRL rept. no. 5686)
Unclassified report

DESCRIPTORS: Alloys, *Ferrites, Radiation damage, *Neutron bombardment, *Magnetic properties, Magnetic fields, Neutron diffraction analysis, Magnetic moments, Hysteresis, *Ferromagnetic materials, Metallic compounds, Oxides, Heat treatment, Magnetic materials.

Studies were made on the effects of neutron irradiation on the magnetic characteristics of metal alloys and ferrites. The magnetic properties included the coercive force, remanence, shape of the hysteresis loop, Curie temperature, and magnetic moment. Only the Curie temperature was found to be relatively insensitive to neutron irradiation; all the other properties were modified by varying amounts. The radiation sensitivity of metal alloys and selected ferrites appears to be primarily related to the dependence of magnetic properties on the short-range ordering of the atoms along certain crystallographic directions. Materials which can be easily ordered show the greatest sensitivity. It has been found that the application of a magnetic field during irradiation can cause directional ordering to take place which in many cases produces more desirable magnetic characteristics. The studies of the ferrites are more complicated since the effects appear to be related to atomic displacements as well as possible radiation induced oxidation. This has been deduced from magnetic measurements of irradiated samples coupled with neutron diffraction data of the same material. (Author)

AD-262 274 Div. 25
(5 Sep 61) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
RADIATION BY PLASMA OSCILLATIONS INCIDENT ON A DENSITY DISCONTINUITY,
by D. A. Tidman and J. M. Boyd. July 61, 24p. incl. illus. (Technical note no. BN-252)
(Contract AF 18(600)1315)
(AFOSR-1272) Unclassified report

DESCRIPTORS: Magnetohydrodynamics, *Plasma oscillations, *Electromagnetic waves, *Density, Plasma physics, Electrons, Ions, Wave analysis, Perturbation theory, Electromagnetic wave reflections.

The electromagnetic radiation produced by plasma oscillations propagating across a density discontinuity is calculated, and the boundary conditions to be applied in this process are discussed in some detail. (Author)

AD-262 277 Div. 25
(1 Sep 61) OTS price $5.60

Technische Hochschule, Hannover (Germany).
STRONG PLASMA SHOCK WAVES AND EXCITATION OF PLASMA OSCILLATIONS.
Technical rept. on The Supposed Excitation of Plasma Oscillations by Gasdynamic Shock Waves in a Plasma,
by Joachim Kolbel. 15 Sep 60, 57p. incl. illus.
(Contract AF 61(052)161)
(AFCRL-559) Unclassified report

DESCRIPTORS: *Plasma oscillations, Plasma physics, Excitation, Extraterrestrial radio waves, *Shock waves, Radio astronomy, Energy, Electrons, Solar corona, Temperature, Ions, Entropy, Density, Radio waves, Continuum mechanics, Continuous media.

In view of radioastronomical observations and thermonuclear experiments very strong shock waves in a fully ionized plasma are theoretically investigated by hydrodynamical methods. Including all essential effects of entropy generation the distribution of density and temperatures of ions and electrons are computed with the result that these temperatures are differing by several orders of magnitude within the shock by running an electron temperature and pressure wave ahead of the density jump. Plasma oscillations are excited ahead of the shock front, if the front velocity transgresses the electron sound velocity, leading thus to an instability of the shock structure. (Author)

AD-262 282 Div. 25
(1 Sep 61) OTS price $9.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH. DIVISION 8, GROUPS 53 AND 26.
Quarterly progress rept.
15 July 61, 87p. incl. illus. tables.
(Contract AF 19(604)7400)
(AFESD TN 61-1013) Unclassified report

DESCRIPTORS: *Semiconductors, Materials, Solids, *Magnetic materials, Chemistry, Alloys, Magnets, Thin films, *Optics, Microwaves, Radiation damage, Infrared detectors, Intermetallic compounds, Electronic equipment, Diodes, Transistors, *Single crystals, Conductivity, Absorption, *Solid state physics, Design.

Division 26 - PRODUCTION AND MANAGEMENT

Contents:
Solid State Device Design
Chemistry
Materials Research
Band Structure of Solids
Microwave and Magnetic Properties of Solids
Magnetic Materials
Magnetic Films
Semiconductor Components
Optics and Infrared

AD-262 299 Div. 25, 4
(1 Sep 61) OTS price $6.60

Laboratory of Chemical and Solid-StatePhysics, Mass. Inst. of Tech., Cambridge.
(No title).
Annual research rept. no. 3.
15 July 61, 53p. 146 refs.
(Contracts Nonr-184101, Nonr-184123, Nonr-184134, AF 19(604)5200, AF 33(616)6070, AF 49(638)95, DA 19-020-ORD-4919, DA 36-039-sc-78108 and NObs-65918)

Unclassified report

DESCRIPTORS: *Solid state physics, *Solids, *Molecular structure, *X-ray diffraction analysis, Neutron diffraction analysis, *Thermodynamics, *Cryogenics, *Nuclear magnetic resonance, *Molecular spectroscopy, Metallic compounds, *Complex compounds, *Polymers, *Metallurgy, Mechanical properties, Boron compounds, Nickel compounds, Cobalt compounds, Polymer solutions, Molecules, Infrared spectroscopy, Crystal structure, Molecular beams, Metal films, Gas diffusion, Coding, Automatic, Deformation, Diffraction, Intermetallic compounds, Elasticity, Research program administration.

Contents:
Solid-state and molecular theory
Structure of solids by X-ray and neutron diffraction
Low-temperature and thermal properties of matter
Nuclear magnetism
Molecular spectroscopy
Interatomic and intermolecular forces
Chemical and physical studies of transition metal compounds
Electrical and optical properties of thin metal deposits
Physical chemistry of macromolecules
Physical metallurgy
Mechanical properties of solids

26. PRODUCTION AND MANAGEMENT

AD-261 561 Div. 26, 14, 31
(21 Aug 61) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF SEALS FOR HIGH PRESSURE AIR SYSTEMS IN SUBMARINES.
Progress rept. no. 1,
by R. D. Ford and R. E. Morris. 28 Dec 60, 11p. incl. tables (Rept. no. 28-3)
(Proj. S-F013-13-01)

Unclassified report

DESCRIPTORS: *Rubber seals, *Seals, Rubber, Synthetic rubber, Submarines, High pressure research, High pressure compressors, Lubricants, Petroleum, Esters, Phosphates, Fluorides, Vulcanizates, Nitrile rubber, Elastomers, Mechanical properties, Fluorocarbons, Hardness, Tests, Materials.

Rubber O-ring seals for high-pressure submarine air systems were tested for their ability to withstand sudden pressure drops from 4500 to psig. Stocks were prepared from nitrile, carboxylated nitrile, polyurethane, and polysulfide rubbers for service with petroleum-based fluids; stocks prepared from fluoro rubbers were also tested for service with phosphate-ester fluids. Hardness ranged from 83 to 96 Shore A. Damage was appraised by the volume changes of O-rings from these vulcanizates. The results indicated that nitrile, carboxylated nitrile, polyurethane, and fluoro rubber vulcanizates would be satisfactory seals. It appeared that seal stock for service with either type of lubricant could be developed from the fluoro rubber.

AD-261 562 Div. 26, 14
(21 Aug 61) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF SEALS FOR HIGH PRESSURE AIR SYSTEMS IN SUBMARINES.
Progress rept. no. 2,
by R. D. Ford. 2 Feb 61, 6p. incl. tables (Rept. no. 28-4)
(Proj. S-F013-13-01)

Unclassified report

DESCRIPTORS: *Rubber seals, *Seals, Rubber, Synthetic rubber, Submarines, High pressure compressors, High pressure research, Lubricants, Petroleum, Esters, Phosphates, Fluorocarbons, Vulcanizates, Nitrile rubber, Elastomers, Carbon black, Carboxylic acids, Mechanical properties, Hardness, Materials, Polymers, Tests.

Stocks were prepared from Hycar 1071 loaded with different high-structure carbon blacks. These were intended for use with petroleum-based lubricants. The hardness of the various vulcanizates ranged from 70 to 90 Shore A. The damage to the vulcanizates caused by a sudden drop of air pressure from 5000 to 0 psig was appraised by measuring the change in volume of O-rings made from the vulcanizates. The results of the tests indicated that all of the stocks are satisfactory for this service. These findings are to be tested by simulated service tests. The development of stocks for O-rings for use with either petroleum or phosphate-ester lubricants is being continued. (Author)

AD-261 563 Div. 26, 14, 31
(21 Aug 61) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF SEALS FOR HIGH PRESSURE AIR SYSTEMS IN SUBMARINES.
Progress rept. no. 3,
by R. D. Ford. 11 Apr 61, 13p. incl. illus. tables (Rept. no. 28-5)
(Proj. S-F013-13-01)

Unclassified report

DESCRIPTORS: *Rubber seals, *Seals, Rubber, Synthetic rubber, Vulcanizates, Nitrile rubber, Elastomers, Submarines, High pressure compressors, High pressure research, Lubricants, Petroleum, Esters, Phosphates, Fluorides, Fluorocarbons, Carbon black, Mechanical properties, Hardness, Materials, Tests.

Stocks were prepared from both Viton A-HV and Viton B loaded with various high-structure carbon blacks. All stocks had a nominal hardness of 80 Shore A. The damage to the vulcanizates caused by a combination of immersion in either the phosphate-ester or petroleum-base oils and a sudden drop in air pressure from 5000 to 0 psig. was appraised by measuring the change in volume of O-rings made from the vulcanizates. Vulcanizates of Viton B and Viton A-HV appeared equal in resistance to these conditions. After conditioning for 46 hr or more in 5000 psig air followed by rapid decompression, the best Viton A-HV O-rings developed to date were observed on occasion to develop blisters on the surface of the O-rings. The development of improved Viton stocks having greater resistance to swelling and blistering is being continued. (Author)

AD-261 564 Div. 26, 14, 31
(21 Aug 61) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF SEALS FOR HIGH PRESSURE AIR SYSTEMS IN SUBMARINES.
Progress rept. no. 4,
by R. D. Ford and R. E. Morris. 9 June 61, 18p. incl. illus. tables (Rept. no. 28-6)
(Proj. S-F013-13-01)
Unclassified report

DESCRIPTORS: *Rubber seals, *Seals, Rubber, Synthetic rubber, Vulcanizates, Nitrile rubber, Elastomers, Fluorocarbons, Submarines, High pressure compressors, High pressure research, Lubricants, Petroleum, Esters, Phosphates, Silicones, Fluorides, Carbon black, Mechanical properties, Tensile properties, Materials, Tests.

Viton A-HV (Compound A) stocks and a Viton B stock were tested for tensile properties, and for swelling after lengthy exposure to air at 5000 psi pressure followed by rapid decompression. One of these Viton A-HV stocks proved to be outstanding in all respects. Its swelling after decompression was again checked, this time after prior immersion in petroleum-base oil and in phosphate-ester oil. The swelling was found to be very moderate (10% at most). A formulation prepared from fluorosilicone rubber was tested for tensile properties and for decompression swelling after prior immersion in the oils and lengthy exposure to air at 5000 psi pressure. Its tensile properties were poor, but its resistances to the oils and to decompression swelling were excellent. It was considered to be suitable for static service only. O-rings made from a Hycar 1071 stock were installed in the air compressor on the USS THEODORE ROOSEVELT, which is lubricated by petroleum-base oil. The O-rings have sealed satisfactorily for at least 341 hours. (Author)

AD-261 593 Div. 26, 8
(5 Sep 61) OTS price $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
ULTRASONIC GRINDING TECHNIQUES IN MICROMINIATURIZATION,
by John Krawczyk. 28 July 61, 32p. incl. illus. table (DOFL rept. no. TR-958)
(Proj. no. 96300)
Unclassified report

DESCRIPTORS: Machine tools, Machining, *Ultrasonics, *Grinders, Design, Operation, Abrasives, Sheets, Cutting tools, Ceramic materials, *Miniature electronic equipment, Production, Processing, Ferrites, Electronic equipment, Subminiature electronic equipment.

Ultrasonic impact grinding techniques are shown to be extremely useful in the fabrication of microcircuit substrates and other specialty component parts. Pertinent parameters of machine operation and tool design are discussed and detailed examples of applications are given. These include the fabrication of (1) sections of glass only 0.005 in. in thickness, (2) multihole substrates, (3) Hall measurement specimens, (4) tiny toroids, and (5) spiral grooves. (Author)

AD-261 779 Div. 26, 25
(23 Aug 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INDUSTRIAL USE OF ULTRASOUND (SELECTED PART)
(Primeneniye Ul'trazvuka v Promyshlennosti).
26 Apr 61, 20p. incl. illus. (Trans. no. MCL-810 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moscow, pp. 287-302, 1959)
Unclassified report

DESCRIPTORS: *Welding, *Ultrasonics, Spot welding, Sheets, Heat resistant alloys, Welded joints, Films, Surface properties, Electric arcs, Slags, Mechanical properties, Crystal structure, Crystallization, Phase transitions, USSR.

An investigation of the use of ultrasound in welding indicated that (1) ultrasound can be used as a source of energy for the formation of welded joints not only of metals but also of nonmetallic materials, by spot, seam, and butt welding; (2) ultrasound in combination with the usual contact welding can simplify the process of welding by destroying the surface films; (3) during arc and electro-slag welding, by the action of ultrasound on the welding bath in the process of its crystallization, it is possible to improve the mechanical properties of welded joints by breaking up the metal structure of the seam and removal of gases; and (4) a finished weld may be strengthened and improved by reducing stresses and deformations which appear after welding.

AD-261 941 Div. 26, 17
(28 Aug 61) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF 2400 DEGREES F FORGING DIE SYSTEM.
Interim technical progress rept. 28 Mar-27 June 61,
by J. T. Berry, A. Murphy and others. July 61, 28p. incl. illus.
(Contract AF 33(600)42861, Proj. 7-886)
(ASD TR 7-886, vol. 1) Unclassified report

DESCRIPTONS: *Dies, Refractory materials, *Forging, Materials, Heat resistant alloys, Nickel alloys, Chromium alloys, Effectiveness, High temperature research, Design, Molding materials, Graphite, Processing, Tungsten, Molybdenum alloys, Niobium alloys, *Extrusion.

Division 26 - PRODUCTION AND MANAGEMENT

An investigation was initiated to evaluate the upper operating temperature limit of Inconel 713 C hot forging dies; to minimize the required forging sequence by using hot dies; and to develop new die materials for use up to 2400 F. Minimizing forging sequences was sought through a redesign of the hot die configuration to provide single-step extrusion-forging to the final shape. Rammed monolithic graphite molds, for casting to shape the die cavity, and die design are described. Refractory metals currently under consideration for 2400 F forging dies include pure W, TZM and TZC Mo alloys, and F 48 Nb alloy. Evaluation methods for preliminary screening of candidate die materials include a simple compression test, a notched bend test, and a standard penetrator test. (Author)

AD-261 945 Div. 26, 17
(29 Aug 61) OTS price $9.10

Aluminum Co. of America, Cleveland, Ohio.
EVALUATION OF NUMERICALLY CONTROLLED MACHINING OF FORGING DIES.
Final technical engineering rept. Dec 57-July 60,
by A. R. Callender and D. I. Alkire. Apr 61, 100p. incl. illus. tables.
(Contract AF 33(600)36215, Proj. 7-667b)
(AMC TR 61-667b) Unclassified report

DESCRIPTORS: Machine tools, *Machining, Cutting tools, *Milling machines, Control systems, Control, *Computers, Electronic equipment, Programming, *Dies, Forging, Extrusion, Automation.

Because of die requirements and limitations of available programming and computing systems, the cost of numerically controlled processing is not competitive with conventional methods. When automated programming and computing systems with a high order of capability and proficiency are commonly available at reasonable cost, numerically controlled machining of forging dies will offer decreased cost, improved accuracy, better finish, shorter machining times, and stabilized production control with less skilled operators. (Author)

AD-261 979 Div. 26, 8, 14
(28 Aug 61) OTS price $3.60

Corning Glass Works, N. Y.
PILOT PRODUCTION OF GLASS CRYSTAL HOLDERS (HC-(XM-2)/U; HC-(XM-3)/U; HC-(XM-4)/U).
Quarterly progress rept. nos. 10-12, 1 Sep 60-31 May 61,
by R. K. Whitney. 31 May 61, 32p. incl. illus.
(Contract DA 36-039-sc-81255)
Unclassified report

DESCRIPTORS: *Crystal holders, Quartz crystals, Glass, Seals, *Glass seals, Production, Manufacturing methods, Industrial production, Temperature.

Pilot production of the HC-(XM-2)/U and HC-(XM-4)/U has begun. Technical problems with equipment has delayed deliveries of these two holders. Preproduction sealing of the HC-(XM-3)/U holder has yet to be satisfactorily accomplished. The attainment of the specified temperature limit of 250 C. appears to be beyond attainment with the specified glass and metal and current sealing method. (Author)

AD-261 994 Div. 26, 15
(25 Aug 61) OTS price $9.10

Case Inst. of Tech., Cleveland, Ohio.
AN INTEGRATED JOB SHOP SEQUENCING PROBLEM,
by Rudolph C. Heinitz. June 61, 106p. incl. tables, 34 refs.
(Contract Nonr-114111)
Unclassified report

DESCRIPTORS: *Machine shop practice, Sequences, Management engineering, *Scheduling, Statistical distributions, Probability, Equations, Costs.

AD-262 184 Div. 26, 17, 1
(30 Aug 61) OTS price $3.60

Northrop Aircraft, Inc., Hawthorne, Calif.
DEVELOPMENT OF IMPROVED METHODS, PROCESSES, AND TECHNIQUES FOR PRODUCING STEEL EXTRUSIONS.
Interim engineering rept. no. 8, 9 Mar-30 June 61,
by L. M. Christensen and W. Roser. June 61, 33p. incl. illus. tables (Rept. no. NOR 61-199)
(Contract AF 33(600)36713)
Unclassified report

DESCRIPTORS: *Airframes, *Steel, *Extrusion, Manufacturing methods, Processing, Drawing (Machine processing), Chemical milling, Heat treatment, Surface properties, Mechanical properties, Diffusion, Nickel, Tensile properties, Corrosion resistant alloys, Hardness, Microstructure, Dies, Nickel plating, Lubricants, Glass.

Dimensional integrity and surface qualities obtained in the 0.06-in. tee sections of Phase I are considered sufficient for proceeding to Phase II. Low and erratic mechanical properties were noted in the evaluation of Phase I extrusions in both H-11 and PH 15-7Mo materials. Metallurgical studies indicated that these low properties resulted from diffusion of the nickel lubricant material into the surface of the extrusions. After removal of the contaminant coating by chemical etching, the resultant mechanical properties were well within specifications for the materials. The chemical etching also yields improved surface quality. (Author)

AD-262 218 Div. 26, 15
(31 Aug 61) OTS price $2.60

Pacific Div., Bendix Aviation Corp., North Hollywood, Calif.
MAXIMIZING THE EXPECTED TIME OF OPERATION OF A GIVEN SYSTEM,
by J. H. Dorsey, G. W. Dauncey, and M. Mandel. 13 Nov 59, 21p. incl. tables.
Unclassified report

Presented at the Sixteenth National Meeting of Operations Research Soc ety of America, Pasadena, Calif., 13 Nov 59.

DESCRIPTORS: Control systems, *Quality control, *Reliability, Maintenance, Matrix algebra, Probability, Statistical analysis, Differential equations, Aerial reconnaissance, Weather forecasting.

A study of an air weather reconnaissance system undertaken by Bendix required considering the device as a whole as being composed of several

main parts, each having its own failure and repair parameters. When any single part failed the whole system was considered to be in a failed state. It was desired to determine just how these parts would interact statistically to effect the total expected operating time of the entire system. The need for a generalization to a system with n parts with different failure and repair parameters prompted the detailed study expounded. (Author)

AD-262 254 Div. 26, 30, 8, 6, 18
(1 Sep 61) OTS price $6.60

General Electric Co., Syracuse, N. Y.
AIR WEAPONS CONTROL SYSTEM 412L. RELIABILITY PROGRAM.
31 May 61, 69p. incl. illus. (Rept. no. AWCS-SR-1R2)
(Contract AF 30(635)10117)
Unclassified report

DESCRIPTORS: *Aircraft intercept control system, *Ground controlled interception systems, *Antiaircraft defense systems, Mobile, Reliability, Air control centers, Maintenance, Electronic equipment, Data processing systems, Radar equipment, Communication equipment, Display systems, Functional analysis, Mathematical prediction, Human engineering, Test methods, Manufacturing methods, Design, Research program administration, Quality control.

The reliability program is described in effect under the system integration and management portion of the development program for Air Weapons Control System 412L. (Author)

27. PROPULSION SYSTEMS

AD-261 541 Div. 27
(21 Aug 61) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
SHIELDING DEVICE AGAINST RF ENERGY FOR ZUNI ROCKET MOTOR MK 16 MOD 0,
by R. N. Skeeters and S. Shefler. Aug 61, 12p. incl. illus. (NOTS TP 2714)
(NAVWEPS rept. no. 7747)
Unclassified report

DESCRIPTORS: *Rocket motors, *Shielding, *Electromagnetic shielding, Ignition, Hazards, Electromagnetic fields, Voltmeters, Electric currents, Measurement, Steel, Safety devices, Radiofrequency, Electromagnetic waves, Rockets, Air-to-air.

This report describes a shielding device used to protect the ignition terminal of the Zuni Rocket Motor Mk 16 Mod 0 from contact with sources of current and from the effects of electromagnetic fields that otherwise might induce current in the ignition circuit and possibly cause premature ignition. The theory of shielding as a protection against radio frequency (RF) fields is reviewed, and instrumentation for detecting RF energy in the ignition circuit is described. (Author)

AD-261 642 Div. 27, 30
(21 Aug 61) OTS price $4.60

Rocketdyne, Canoga Park, Calif.
THE NON-STATISTICAL ASPECTS OF THE STATISTICAL DESIGN OF ROCKET ENGINE EXPERIMENTS,
by J. M. Zimmerman. 25 July 61, 44p. 20 refs.
(Research rept. no. 61-22)
Unclassified report

DESCRIPTORS: *Rocket motors, Test methods, Tests, Programming, *Scheduling, *Statistical processes, Statistical analysis, Test facilities.

A general approach to statistical test planning of rocket engine test programs is described. Emphasis is placed on the methodology for generating the test plans rather than on details of the statistical procedures. Establishment of the program objectives involves quantification of objectives, planning test programs, and consideration of their statistical aspects. Consideration of and provision for program variables as well as experimental design and analysis of data are discussed.

AD-261 753 Div. 27, 26, 17
(23 Aug 61) OTS price $1.10

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J.
RADIAL EXTRUSION OF TURBOJET DISCS.
Interim engineering rept. no. 11, 1 Apr-30 June 61,
by Robert W. Krohn. 30 June 61, 7p. incl. illus.
(Serial rept. no. MPOO-231)
(Contract AF 33(600)37191)
Unclassified report

DESCRIPTORS: *Turbojet engines, *Gas turbine disks, Manufacturing methods, Extrusion, Steel, Titanium alloys, Machining, Forging, Precision finishing, Dies, Tools, Mechanical properties, Hardness, Cadmium plating, Grinders, Cutting fluids, Coolants, Production, Processing, Heat treatment, Hydraulic presses, Deformation.

Procedures for the machining of full-scale steel and Ti alloy disks for turbojet engines are detailed. Six steel disks were produced to specification, and mechanical property data are presented. Difficulties were encountered in the production of Ti alloy disks. Distortion and excessive shrinkage of the disk occurred when cooled from the forging temperature. Distortion was partially corrected by the use of fixtures during annealing but was encountered again during rough machining. Excessive grinding burns and burrs were corrected by the use of coolants. Broaching of the fir tree slots was accomplished at speeds of 30 to 35 fpm by the use of a 2:1 mineral seal oil-fatty chlorinated hydrocarbons and sulphurized polymerized terpenes solution as a coolant.

AD-261 780 Div. 27
(22 Aug 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY AND DESIGN OF PUMPS FOR LIQUID-FUEL

Division 27 - PROPULSION SYSTEMS

ROCKET ENGINES (Teoriya I Raschet Nasosov Zhidkostnykh Raketnykh Dvigateley),
by B. V. Ovsyannikov. 23 May 61, 312p. incl. illus. tables, 28 refs. (Trans. no. MCL-841 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Oboronigiz, Moscow, 247p., 1960)
Unclassified report

DESCRIPTORS: *Rocket motors, Fuel systems, *Fuel pumps, Liquid rocket propellants, Rocket fuels, *Centrifugal pumps, Rotary pumps, Design, Theory, Rocket propulsion, USSR, Bibliography, *Textbooks.

This publication was designed as a textbook for students and engineers on the theory and design of pumps for liquid-fuel rocket engines. Topics include: applications of pumps in liquid rocket fuel systems; basic concepts pertaining to ZhRD centrifugal pumps and cavitation in centrifugal pumps for ZhRD; efficiencies of centrifugal pumps; operation, characteristics and design of centrifugal pumps; and concise information on existing ZhRD pumps.

AD-261 959 Div. 27, 12, 26, 17
(28 Aug 61) OTS price $4.60

Aerojet-General Corp., Sacramento, Calif.
STRUCTURAL TESTS OF A CHEMICALLY MILLED LADISH D-6ac STEEL SECOND-STAGE MINUTEMAN AFT CLOSURE,
by R. W. Thomas. July 61, 43p. incl. illus. tables.
(Contract AF 33(600)36610)
(AFBSD TN 61-1; AFBM Exhibit 58-1)
Unclassified report

DESCRIPTORS: Guided missiles, Surface to surface, *Rocket cases, Steel, Processing, *Chemical milling, Mechanical properties, Stresses, Deformation, Hydrostatic pressure, Tests, Staging, Measurement, Design, Rocket motors.

A study was made to determine if the structural strength requirements for the aft closure of the second-stage Minuteman engine could be met with reduced-weight, chemically milled closure of Ladish D-6ac steel. The study indicated that the chemically milled aft closure, which weighed 60 lb less than the conventional steel closure, had satisfactory structural strength. The structural tests were made with an aft closure of the Preliminary Flight Rating Test (PFRT) design. The closure was chemically-milled twice to reduce the thickness of part of the shell, the nozzle bosses, and the bolted joint. Stresscoat was applied to the aft closure and the unit was hydrostatically tested after each milling operation. An analysis of stress and strain data indicated that the reduced-weight closure satisfactorily withstood a pressure of 600 psig and will meet ultimate strength design criteria. (Author)

AD-262 028 Div. 27, 12, 26
(28 Aug 61) OTS price $1.60

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES.
General rept. no. 9 for 30 Apr-31 May 61.
31 May 61, 13p. incl. illus.
(Contract NOw 60-0630)
Unclassified report

DESCRIPTORS: *Rocket cases, *Rocket motors, *Guided missiles, Underwater to surface, Surface to surface, Manufacturing methods, Drawing (Machine processing), Heat treatment, Non-destructive testing, Hydrostatic pressure, Quality control, Tests.

AD-262 039 Div. 27, 25
(25 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
RECOMBINATION OF HYDROGEN-AIR COMBUSTION PRODUCTS IN AN EXHAUST NOZZLE,
by Erwin A. Lezberg and Richard B. Lancashire. Aug 61, 43p. incl. illus. (Technical note no. D-1052)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1052.

DESCRIPTORS: *Exhaust nozzles, *Ramjet engine nozzles, *Ramjet engines, *Thrust, *Exhaust gases, Combustion chamber gases, *Ramjet propulsion, Gases, Dissociation, Hydrogen, Air, Gas flow, Thermodynamics, Test facilities, Instrumentation, Recombination reactions, Hypersonic flow.

Thrust losses due to the inability of dissociated combustion gases to recombine in exhaust nozzles are of primary interest for evaluating the performance of hypersonic ramjets. Some results for the expansion of H-air combustion products are described. Combustion air was preheated up to 3300 R to simulate high-Mach-number flight conditions. Static-temperature measurements using the line reversal method and wall static pressures were used to indicate the state of the gas during expansion. Results indicated substantial departure from the shifting equilibrium curve beginning slightly downstream of the nozzle throat at stagnation pressures of 1.7 and 3.6 atmospheres. The results are compared with an approximate method for determining a freezing point using an over-all rate equation for the oxidation of H. (Author)

AD-262 043 Div. 27, 12
(28 Aug 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
DEVELOPMENT OF A 5.0-INCH LIQUID-PROPELLANT TARGET-ROCKET MOTOR,
by Alan J. Hugo. Feb 61, 28p. incl. illus. tables (NOTS TP 2628)
(NAVWEPS rept. no. 7624) Unclassified report

DESCRIPTORS: *Rocket motors, Liquid rocket propellants, Design, Flight testing, Tests, Fuel injectors, Pressure tanks, Nitrogen, Fuel systems, Propellant tanks, Combustion chambers, Pressure, *Rocket targets, Rockets, Guided missiles, Air to air, Gases, Nitric acid, Methyl hydrazines.

A 5.0-inch, storable, liquid-propellant propulsion system utilizing the hypergolic propellant combination of IRFNA and UDMH was designed and tested. Nine motor assemblies were static-fired, and 6 motors were flight-tested in a configuration capable of being used as a guided target rocket. This design provides positive expulsion of the propellants under all flight conditions. Nominal thrust with a Centro-mix injector is 200 lb for 33 sec; with a variable-thrust injector designed to be used with the system, thrust is variable from 50 to 300 lb. The 5.0-inch liquid target motor features welded aluminum alloy propellant tanks that are opened simultaneously by a bipropellant explosively actuated valve; a 3500-psi N bottle as the source of pressurizing gas; a stainless steel combustion chamber with a graphite liner; and a simple injector. (Author)

AD-262 047 Div. 27, 17, 9
(28 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
GAS FLOW, EMITTANCE, AND ION CURRENT CAPABILITIES OF POROUS TUNGSTEN,
by Thaine W. Reynolds and Lawrence W. Kreps. Aug 61, 43p. incl. illus. table, 12 refs. (Technical note no. D-871)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-871.

DESCRIPTORS: *Porous metals, *Tungsten, *Electric propulsion, Ion rockets, *Gas flow, Measurement, Ionic current, Cesium, Porous materials, Thermionic emission, Powder metals, Sintering, Disks, Hydroforming, Propellant properties, Surfaces, Diffusion, Gas ionization.

Analysis of Cs ion current and propellant utilization capabilities of porous W, based on a simple model of a porous structure, indicates that pore sizes of 1 micron and less would be desirable. Gas flow measurements indicated that some difficulty might be experienced in operating smaller particle size porous W structures at the required surface temperature for high current density because of the possible sintering of the W. Experimental gas flow measurements through porous W disks made from 1-, 10-, and 20-micron powder are presented. Sintering temperatures above 1500 K affected the permeability of the 1-micron-pore material. This temperature range is a desired operating range of the Cs-W system for ion rocket applications. Emissivity measurements on these same materials yielded an average spectral emittance of about 0.8 at a wavelength of 0.65 micron. Total radiation measurements gave emittance values in the range of 0.31 to 0.68. (Author)

AD-262 056 Div. 27, 12
(28 Aug 61) OTS price $6.60

Naval Ordnance Test Station, China Lake, Calif.
DETERMINATION OF ROCKET-MOTOR MASS BY MEASUREMENT OF THE NATURAL FREQUENCY OF A MASS-SPRING SYSTEM,
by Benjamin Glatt. 15 June 61, 66p. incl. illus. (NOTS TP 2706)
(NAVWEPS Rept. no. 7741) Unclassified report

DESCRIPTORS: Rocket motors, Solid rocket propellants, Combustion, Thrust, Specific impulse, Measurement, Rocket propellants, Integral transforms, Partial differential equations, Control systems, Servomechanisms, Mathematical analysis, Acceleration, Damping.

A system is described whereby the mass of a rocket motor being tested in a static test stand can be determined continuously while burning. The motor is mounted on springs and driven by the force of a rotating eccentric mass so as to oscillate at the natural frequency of the mass and spring system. Given the spring constant, the mass of the system can then be calculated from the frequency of oscillation. Given a required accuracy of 1 percent for the measurement of the mass of the motor, the specifications for the control system are determined. A control system is designed, analyzed, and shown to meet the requirements of the system with the expected input signals and external disturbances. (Author)

AD-262 061 Div. 27, 12
(29 Aug 61) OTS price $.75

Materials Central, Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
ION PROPULSION WORKING FLUID REQUIREMENTS FOR USAF.
Rept. for Apr-Nov 60, on Aviation Fuels,
by James H. L. Lawler. Jan 61, 21p. incl. illus. 46 refs.
(Proj. 3048)
(WADD TR 60-901) Unclassified report

Presented to the American Institute of Chemical Engineering in conjunction with the National Symposium on Chemical Engineers in the Air Force at Washington, D. C., December 5-7, 1960.

DESCRIPTORS: *Ion rockets, *Electric propulsion, Satellite vehicles, Lunar probes, Spaceships, Space flight, Specific impulse, Physical properties, Ionization, Colloids, Aerosols, Photochemical reactions, Free radicals, Ions, Aviation fuels, Military requirements, *Bibliography.

Some of the anticipated requirements for ion engine working fluids are derived by the consideration of missions expected to be of interest, the probable systems which will produce the power, and handling needs. Summary of requirements: (1) high mass-to-charge ratio (about 2000 AMU singly ionized); (2) one ion species; (3) Liquefaction somewhere between 0 - 600 C; (4) vaporization under 1000 C; (5) low energy of ionization; (6) compatibility with normal lightweight structural materials; (7) lack of toxicity is convenient; (8) stability to radiation; (9) some easy method of ionization; (10) easy desorption from some high work function material; and (11) non-fragmentation. (Author)

AD-262 077 Div. 27, 10, 25
(25 Aug 61) OTS price $5.60

Rocketdyne, Canoga Park, Calif.
THE BEHAVIOR OF PRESSURE WAVES IN A PRESSURE DEPENDENT COMBUSTION FIELD: PART I,
by I. Mirsky. Aug 61, 49p. incl. illus. (Rept. no. R-3152)
(Contract AF 49(638)817, Proj. 9751)
(AFOSR-975) Unclassified report

DESCRIPTORS: *Combustion, Stability, *Rocket motors, Liquid rocket propellants, Pressure, *Oscillation, Acoustics, Gas flow, Mathematical analysis, Differential equations.

A study is made of one of the physical processes capable of driving and sustaining acoustic resonance in a thrust chamber, namely a pressure sensitive heat release rate. Approximate conditions are obtained on the pressure exponent n to produce decay or growth of the initial pressure disturbance. The nonlinear equations for a nonviscous compressible fluid are then solved to a second order approximation for the special case n equals 1. Results indicate growth of the pressure wave for this value of n. (Author)

AD-262 196 Div. 27, 10
(30 Aug 61) OTS price $1.60

Thompson Ramo Wooldridge, Inc., Rocky Mount, Va.
PUMPING HYDRAZINE WITH A TURBOPUMP,
by I. Sheer. 14 Aug 61, 17p. incl. illus.
(ER-4152)
(Contract AF 33(616)6774)
(AFFTC TR 60-53) Unclassified report

DESCRIPTORS: Pumps, *Fuel pumps, *Centrifugal pumps, *Hydrazines, Feasibility studies, Temperature, Materials, Stainless steel, Polymers, Fluorides, Ethylenes, Seals, Cavitation, Design, Tests, Liquid rocket propellants, Rocket fuels.

Feasibility studies of pumping hydrazine with a turbopump are reported. The results show that vapor lock, cavitation, and dead ending can be tolerated with hydrazine. Careful attention must be paid to the temperature rise which results from dead ending or flow stoppage due to vapor lock, however the rise in the case of the pump tested was gradual enough to allow corrective action by an observer. Materials chosen for construction of impeller, housing, seals, and shaft stood up well under a wide range of conditions of operation for a total running time of 55 minutes and 33 seconds. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-261 553 Div. 28, 30, 16
(21 Aug 61) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
SYSTEMS OPERATOR PROFICIENCY. EFFECTS OF SPEED STRESS ON OVERLOAD PERFORMANCE,
by Bryce O. Hartman and Richard E. McKenzie. June 61, 9p. incl. illus. tables (Rept. no. 61-40)
Unclassified report

DESCRIPTORS: Cybernetics, *Pilots, Stress (Physiology), *Personnel, Effectiveness, *Stress (Psychology), Behavior, Achievement tests, Operation, Test methods, Control simulators.

A study was made to determine the effects of speed and overload stress on the performance of systems operators during overload. The overload performance was evaluated as affected by (1) three base work rates well below the operator's capacity and (2) a work rate that approximated his effective level. In the range of signals tested, no work rate effects were obtained. Speed stress effects are apparently a function of the immediate operator load and are independent of preceding load levels. Certain adaptive strategies related to overlapping signals may be significant factors in overload performance. (Author)

AD-261 571 Div. 28, 23
(17 Aug 61) OTS price $1.60

Bureau of Naval Personnel, Washington, D. C.
DEVELOPMENT OF THE APPLICANT QUALIFICATION TEST FORMS 8 AND 9,
by Allen N. Smith and Isaiah Guttman. Apr 61, 8p. incl. tables (Technical bulletin no. 61-8)
Unclassified report

DESCRIPTORS: Tests, Design, *Personnel, Aptitude tests, *Selection, *Recruiting, Analysis.

The Applicant Qualification Test (AQT) is administered at recruiting stations to men who apply for enlistment in the Navy. It represents the first test information the Navy receives about a potential recruit. The AQT is designed to provide an estimate of the mental level of an applicant as measured by the Armed Forces Qualification Test (AFQT). It serves to screen out applicants. Men selected on the basis of their AQT results are sent to the Armed Forces Examining Station (AFES) for additional screening by AFQT scores. Effective prescreening of candidates reduces expenditures of time, money and effort that would otherwise be involved in transporting AFES applicants who would fail on the AFQT. Occasionally the AQT is also used to identify recruits to whom commitments may be made for special training programs. (Author)

AD-261 605 Div. 28, 26
(21 Aug 61) OTS price $2.60

Tulane U., New Orleans, La.
INCENTIVE CONDITIONS AND BEHAVIOR IN 188 INDUSTRIAL MANUFACTURING ORGANIZATIONS.
Technical rept. no. 3 on Leadership and Organizational Behavior Test of a Proposed Theory,
by George J. Palmer, Jr. and Ronald H. Schroeder, June 61, 30p. incl. tables.
(Contract Nonr-47508)
Unclassified report

DESCRIPTORS: *Behavior, *Industrial psychology, Industrial plants, Industrial production, Industrial mobilization, Personnel, *Job analysis, Factor analysis, Attitudes, *Group dynamics, Effectiveness.

Relationships among organizational conditions and personnel behaviors was investigated for a sample of 188 industrial manufacturing establishments. The relationships were resolved into the following orthogonal rotated factors: Retirement Welfare; Cooperation With Survey; Size of Workforce; Thrift Benefits; Costs of Sickness vs. Use of Machinery; Job Aversion; Insurance Benefits; and Theft vs. Discounts. The results tended to support the following general conclusions: Organizational behavior consists of a number of independent classes of behavior, three of which have been identified as related to productivity, job aversion, and theft. These behaviors tend to be linked with different organizational conditions. Productivity is generally related to positive incentives, retirement and insurance benefits having been identified. On the other hand, theft is uniquely related to discounts. But conditions associated with Job Aversion have not been identified. Size of organization as such has no relation to performance. Size is associated with problems of interaction among personnel, and with increased organization and coordination. In general, organizations are a complex of multidimensional conditions and performance, in which the linkages between conditions and behaviors tend to be unique, and in which independent behaviors are related to distinctly different organization conditions. (Author)

AD-261 684 Div. 28, 16
(22 Aug 61) OTS price $1.60

Naval School of Aviation Medicine, Pensacola, Fla.
PSYCHOLOGICAL FACTORS IN SPACE TRAVEL,
by Henry A. Imus. 6 June 61, 7p. 32 refs.
(Special rept. no. 61-4)
Unclassified report

DESCRIPTORS: *Astronautics, *Psychology, *Space medicine, Space flight, Sensory deprivation, Manned, Aviation personnel, Anxiety, Selection.

Reports concerning the psychological factors in space travel are reviewed in order to form a basis for predicting the ability of man to perform in a manned vehicle flight. Speculation concerning anticipated psychological problems is presented for consideration. Scientific data and first hand observation from balloon flights, and from simulated space cabin flights, have provided basic information essential to the prediction of human performance in a manned vehicle missile and orbital flights. Motivation and morale may be controlled by extensive physiological, psychological, and psychiatric screening procedures. Boredom and fatigue may be controlled, in part, by scheduled activity appropriate to the mission. The effects of isolation may be reduced by adequate communication with ground stations encircling the earth. Anxiety may be minimized by developing the cabin and equipment to such a condition of high reliability prior to launch that the Astronauts have complete confidence in their successful return and recovery. The selection of men who have demonstrated consistent and reliable performance in a variety of hazardous missions over a period of years provides the best guarantee of a successful mission into outer space. (Author)

AD-261 749 Div. 28, 23
(22 Aug 61) OTS price $1.60

Walson General Hospital, Fort Dix, N. J.
PSYCHOLOGICAL REACTIONS TO INFANTRY BASIC TRAINING. II. ARE THE CHANGES STABLE.
Final rept. 26 Aug 60-7 Aug 61,
by Daniel R. Lutzker. 7 Aug 61, 17p. incl. tables.
(Proj. 6-60-01-022)
Unclassified report

DESCRIPTORS: *Military personnel, *Military training, *Reaction (Psychology), Personality tests, Adjustment (Psychology), *Personality, *Stress (Psychology).

It was the purpose of this study to determine whether or not personality changes resulting from basic training, as reported by Ekman, Friesen and Lutzker, were stable over time or merely situational reactions to stress. Seventy-nine of the original 92 subjects were retested with the MMPI at least six mo after the completion of basic training. Original test and retest data on these 79 men were analyzed with equivocal results. While some of the differences remained on retest and others did not, some new differences appeared. This leads one to wonder whether the changes reported in the earlier study are truly changes or if the groups differed to begin with. It should be emphasized that these alternatives are not mutually exclusive and that it is quite conceivable (in fact, probable) that both selection of subjects and effects of basic training influenced the results. The original study, conceived as a pilot study, suggested some of the effects that basic training may have. The present study, quite accidentally, pointed out some of the inadequacies of the first. No conclusion can be drawn at the present time regarding the effects of basic training upon personality. A larger scale study controlling more variables which may be relevant (e.g. religion, urban-rural residence, social class, etc.) seems to be needed. (Author)

AD-261 966 Div. 28, 30
(29 Aug 61) OTS price $6.60

Applied Psychological Services, Villanova, Pa.
TECHNIQUES FOR EVALUATING OPERATOR LOADING IN MAN-MACHINE SYSTEMS. A FURTHER APPLICATION OF A MODEL FOR DIGITAL SIMULATION OF ONE OR TWO-OPERATOR MAN-MACHINE SYSTEMS,
by Arthur I. Siegel and J. Jay Wolf. June 61, 63p. incl. illus. tables.
(Contract Nonr-249200)
Unclassified report

DESCRIPTORS: *Human engineering, Simulation, *Applied psychology, Stress (Psychology), Design, Computers, Business machine operators, Feedback, Refueling in flight, Flight simulators, Digital computers, Test methods, Aircraft intercept control systems, Effectiveness.

The purpose of the technique is to allow prediction of system effectiveness while a system is in the early design stage and/or comparative evaluation of alternative system designs. The model is based on the use of a digital computer which sequentially simulates operator performance of each subtask in a total task. As a result of various calculations, output records are obtained of subtask success or failure, task success or failure, peak stress, terminal stress, idle time, waiting time, team cohesiveness, and, in the event of successful task completion, time available but unspent. The method and results of applying the technique to an air intercept by a team composed of a pilot and a radar-observer are reported. No statistically significant differences were obtained between the predictions from the model and real life, outside criteria data for the same task. Generally, the results from the model were rational and conformed with expectancy. (Author)

AD-262 106 Div. 28
(29 Aug 61) OTS price $1.60

Israel Inst. of Applied Social Research, Jerusalem.
SOME DEVELOPMENTS OF A STUDY OF INDUSTRIAL RELATIONS IN ISRAEL,
by Uriel G. Foa. Aug 59, 17p. 15 refs. (Technical note no. 6)
(Contract AF 61(052)121)
(AFOSR TN 60-1423) Unclassified report

DESCRIPTORS: *Industrial relations, *Israel, Sociology, *Management engineering, *Industrial psychology, Psychometrics, Sociometrics, Tests, Job analysis, Group dynamics, Behavior.

The development of a program of research in industrial relations in Israel is described against the changing sociological and ideological background of an industry in rapid expansion. Three stages of the program are considered: (1) morale surveys; (2) the investigation of the foreman-worker relation; and (3) the development of a dynamic theory of interpersonal relations. The substantive, methodological and applied Problems encountered at each stage and the attempted solutions are briefly described. It is also shown that a continuous line of development runs through the various stages. Each successive step was indeed stimulated by the problems and the findings that preceded it. This account has been motivated by the hope that the results obtained may prove useful to other countries and in particular to those areas where the possibility of industrial development depends on the absorption into industry of large masses of unskilled manpower, trained in patterns of living different from those of an industrial culture. (Author)

AD-262 119 Div. 28, 16
(29 Aug 61) OTS price $3.60

Human Factors Research, Inc., Los Angeles, Calif.
HUMAN INFORMATION TRANSMISSION AS A FUNCTION OF

Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

SELECTED VISUAL AND AUDITORY STIMULUS DIMENSIONS,
by Donald N. Buckner and Albert Harabedian.
July 61, 29p. incl. illus. tables, 12 refs.
(Contract Nonr-245300, Proj. NR 145-120)
Unclassified report

DESCRIPTORS: *Information theory, *Communication systems, *Human engineering, Data processing systems, Data transmission systems, Sensory perception, Stimulation, Auditory thresholds, Visual thresholds, Tests, Reaction (Psychology).

AD-262 130 Div. 28
(29 Aug 61) OTS price $7.60

Vanderbilt U., Nashville, Tenn.
STUDIES IN ABSTRACTION LEARNING. V. A PILOT STUDY OF ROTE AND CONCEPT TEACHING IN THE COLLEGE CLASSROOM,
by Leland E. Thune. Aug 61, 72p. incl. illus. tables (Technical rept. no. 7)
(Contract Nonr-214901)
Unclassified report

DESCRIPTORS: *Learning, Reasoning, Applied psychology, Theory, Test methods, Group dynamics, Psychology, Training, *Transfer of training.

The present study constituted an attempt to further test the utility of the perceptual vs. abstraction learning distinction in a regular classroom teaching situation. It was recognized that the ideal arrangement would be to use a multiple-class educational setting in which appropriate controls could be exercised over such basic factors as differences between instructors, course content, and student groups. A class of 45 students in introductory psychology was divided into two matched groups during the middle four weeks of a 12-wk summer semester. During these four weeks the senior author replaced the regular instructor. One group (Rote) was given two 90-min lectures per week, during which the instructor followed the textbook closely and attempted to emphasize facts and concrete examples, but avoided concepts and generalizations. The other half of the class likewise met for two 90 min periods per week, but for this group (Concept) the same instructor presented the material in terms of broad concepts and generalizations, and with practically no reference to the textbook. At the end of the four-week experimental instructional period all students completed an instructor and course rating form, and were given a 75-min examination covering the relevant subject matter. (Author)

AD-262 147 Div. 28, 16
(30 Aug 61) OTS price $1.10

Stockholm U. (Sweden).
AN APPARATUS FOR EXPERIMENTS ON VELOCITY PERCEPTION,
by Gunnar Lenning and Madjid Mashhour, 19 Oct 60, 7p. incl. illus. (Technical (Scientific) note no. 2)
(Contract AF 61(052)300)
(AFOSR-737) Unclassified report

DESCRIPTORS: *Perception, *Velocity, Measurement, Test equipment, Electronic equipment, *Sensory perception, Stimulation, Optical illusions, Visual perception.

An apparatus is described, which is being used for certain experiments on velocity perception and which has to meet certain specified requirements. The electronical set-up permits continuous and independent variation in any direction of the velocity of two stimulus patterns from zero (below the absolute threshold) to a high value (beyond the upper threshold). (Author)

AD-262 148 Div. 28, 16
(30 Aug 61) OTS price $1.60

Stockholm U. (Sweden).
PSYCHOPHYSICAL RELATIONS IN THE VISUAL PERCEPTION OF LENGTH, AREA AND VOLUME,
by Gosta Ekman and Kenneth Junge. 26 Oct 60, 13p. incl. illus. tables (Technical (Scientific) note note no. 3)
(Contract AF 61(052)300)
(AFOSR-738) Unclassified report

DESCRIPTORS: *Visual perception, *Perception, Stimulation, Tests, Measurement.

Subjective length, area and volume as functions of the corresponding stimulus variables were studied in three experiments. The exponents of the psychophysical power functions scattered around 1 for perception of real space. For perspective drawings of cubes and spheres, however, the exponents were about 0.75. It was tentatively concluded that perspective is an insufficient cue to visual volume. The results are discussed with special reference to certain cartographic symbols representing population magnitude. (Author)

AD-262 152 Div. 28
(29 Aug 61) OTS price $1.10

Stockholm U. (Sweden).
A NOTE ON THE SUBJECTIVE SPEED OF MANUAL WORK,
by Gosta Ekman and Anders Herbert. 20 Nov 60, 4p. incl. illus. table (Technical (Scientific) note no. 5)
(Contract AF 61(052)300)
(AFOSR-740) Unclassified report

DESCRIPTORS: Reaction time, *Perception, *Visual perception, Measurement, Velocity.

A preliminary experiment is described, in which the speed of three manual activities was estimated by the method of magnitude estimation. Within the rather narrow stimulus range of 1/1.35 the subjective range was 1/1.86 for card dealing, 1/1.64 for shoveling gravel, and 1/1.41 for packing. Tentative interpretations of these differences are discussed. (Author)

AD-262 154 Div. 28
(30 Aug 61) OTS price $1.10

Stockholm U. (Sweden).
A PSYCHOPHYSICAL STUDY OF CARTOGRAPHIC SYMBOLS,
by Gosta Ekman, Ralf Lindman, and W. William-Olsson. 18 Feb 61, 13p. incl. illus. table, 12 refs. (Technical (Scientific) note no. 6)
(Contract AF 61(052)300)
(AFOSR-1247) Unclassified report

DESCRIPTORS: *Visual perception, Perception, Measurement, Map reading.

In two experiments the subjective volume of certain cartographic symbols was studied by the method of magnitude estimation. The stimulus material consisted of several sets of cubes and spheres, drawn with perspective and shadow. The total range of stimulus volume was 1:3,500. Psychophysical power functions yielded a good fit to all experimental data. The exponents varied from 0.56 to 0.82, most of them being close to the average value, 0.69. The results substantiate the tentative conclusion from a previous study, according to which volume estimates in the case of small projected solids essentially reflect perception of area, and this conclusion is further confirmed by a third experiment designed to throw additional light on this particular question. (Author)

AD-262 166 Div. 28
(31 Aug 61) OTS price $.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
A SURVEY OF CHECKOUT EQUIPMENT USED IN AIR FORCE WEAPON SYSTEMS, WITH EMPHASIS ON THE MAN-MACHINE RELATIONSHIP.
Rept. on Human Factors in Advanced Flight, by Louis T. Pope. May 61, 12p. incl. tables. (Proj. 7184)
(ASD TN 61-38) Unclassified report

DESCRIPTORS: *Human engineering, Aircraft equipment, Design, Automatic, Automation, Guided missiles, Weapons, Test equipment, Tests.

Engineering files of 13 Air Force weapon systems were searched for information on the various types of checkout equipment in use by the Air Force today. In this search, emphasis was placed on the man-machine relationships involved in the operation of the equipment. The information was used in developing a tentative Level-of-Automation scale; and 37 items of checkout equipment were rated on this scale. Checkout equipment problem areas which should be investigated are identified. (Author)

AD-262 189 Div. 28
(30 Aug 61) OTS price $2.60

Oxford U. (Gt. Brit.).
THE EFFECT OF ISOLATION FROM THE FATHER ON THE BEHAVIOR OF MALE THREE-SPINED STICKLEBACKS TO MODELS.
Rept. on Research on Behavior Patterns and Learning Processes, by Esther Cullen. 30 Mar 61, 23p. incl. illus. (Contract AF 61(052)29)
(AFOSR-1033) Unclassified report

DESCRIPTORS: *Behavior, Fishes, Tests.

Male Three-spined Sticklebacks prevented from seeing their (red) fathers, who normally tend them for a few days after hatching, discriminated between male and (non-Red) feamle models no differently from controls with respect to aggresive and courtship behavior. This discrimination was not altered immediately after being beaten up with one of the models. (Author)

AD-262 236 Div. 28
(1 Sep 61) OTS price $2.60

Delaware U., Newark.
A LONGITUDINAL STUDY OF THE ASSIMILATION OF THE NEW CHILD IN THE GROUP, by Robert C. Ziller, Richard D. Behringer, and Ralph V. Exline. 1 Aug 61, 24p. incl. tables, 23 refs. (Technical rept. no. 3)
(Contract Nonr-228502) Unclassified report

DESCRIPTORS: *Group dynamics, *Children, *Sociometrics, Adjustment (Psychology).

The process of the assimilation of the newcomer in the group was traced by means of repeated sociometrics, self reports of the newcomers, and teacher ratings of the newcomers' adjustment, administered over an eleven-week period in twenty-eight elementary school classes to which a new student had been assigned. The data were collected during the afternoon following the newcomers' introduction and again one, two, three, five, seven, and eleven weeks later. The results indicated that (a) girls were assimilated more readily than boys; (b) students in grades one, two and three were assimilated more readily than those in grades four, five, and six; (c) the newcomers' popularity during the first afternoon in the classroom and their popularity eleven weeks later were correlated substantially (r = 0.45); (d) the newcomers' sociometric choices were less popular than the choices of the regular members, but the differences diminished over time; and (e) newcomers changed their socimetric choices more frequently than regular members. Finally the results suggested that the newcomers' mean popularity during the eleven-week period described a U-shaped curve with a marked decline in the early weeks. Several hypotheses were proposed to explain these findings. (Author)

AD-262 259 Div. 28, 15
(1 Sep 61) OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
APPLICATION OF THE ALL-OR-NONE CONDITIONING MODEL TO THE LEARNING OF COMPOUND RESPONSES, by Gordon H. Bower. 7 July 61, 37p. (Technical rept. no. 37)
(Contract Nonr-22517, Proj. NR 171-034) Unclassified report

DESCRIPTORS: *Conditioned reflex, *Learning, Theory, Probability, Matrix algebra, Errors, Mathematical analysis.

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-261 691 Div. 29, 28, 1
(22 Aug 61) OTS price $1.60

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
TIME OF USEFUL CONSCIOUSNESS WHILE REBREATHING FROM PRESSURE SUIT UNDERWATER, DETERMINATION OF, by Julian L. Ragsdale, H. S. Sharma, and M. H. Radliff. 4 Aug 61, 11p. incl. illus. table (Rept. no. NAMC-ACEL-461) Unclassified report

DESCRIPTORS: *Pressure suits, Design, Oxygen equipment, Ventilation, Respiration, Physiology, Flight clothing, Underwater clothing, Helmets, Survival, Simulation, Test methods, Effectiveness.

Results of tests conducted indicate that a gain in survival time during underwater escape involving the full pressure suit can be achieved by rebreathing from the suit proper provided the

pilot is not in a head-down position. This extension in duration of time of useful consciousness is over and above that afforded by use of the emergency oxygen system, if available. During any underwater escape involving the full pressure suit, the helmet visor should be kept closed and sealed and the emergency oxygen system activated. If the emergency oxygen system is inoperable or depleted, a further gain in survival time can be achieved by rebreathing from the suit proper. The duration of the time of useful consciousness when rebreathing from the full pressure suit underwater is a function of the position of the suit controller and carbon dioxide build-up. The findings reported here apply to submersion in water at any depth while wearing the full pressure suit. (Author)

AD-261 953 Div. 29
(28 Aug 61) OTS price $7.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
OPERATION AND SERVICE INSTRUCTIONS. TROOP PREMEDITATED FREE FALL PERSONNEL PARACHUTE ASSEMBLY TYPE A/P28S-3,
by Mitchell B. Kanowski. Aug 61, 68p. incl. illus. (Addendum 1 to AFFTC TR 61-37, AD-261 567)
Unclassified report

DESCRIPTORS: *Parachutes, Release mechanisms, Reliability, Tests, Packaging, Oxygen equipment.

This operation and service instruction covers a free type automatic or manually operated back style parachute assembly designed for premeditated jumping. A free type parachute is one which is attached to the jumper and opened at will, after departing the aircraft, by means of a ripcord operated manually or, at a predetermined altitude, by an automatic ripcord release. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-261 504 Div. 30, 8
(21 Aug 61) OTS price $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
SHORT-TERM FREQUENCY STABILITY MEASUREMENTS,
by Herbert D. Tanzman. Apr 61, 33p. incl. illus. tables (ASRDL Technical rept. no. 2184)
Unclassified report

DESCRIPTORS: Measurement, Test methods, Sensitivity, *Frequency multipliers, Sampling, Oscillators, Radiofrequency oscillators, Harmonic analysis, Radiofrequency amplifiers, *Test sets, Tuned circuits, Power supplies, Design, Scattering, *Crystal oscillators, Tests, Stability, Frequency, Radiofrequency.

Stability of frequency, especially short-term stability, is a matter of importance for a number of applications. Considerable effort was put into the design of a measurement system to determine this stability to a high degree of precision. The measurement system is described and its sensitivity is presented along with test results. It is shown that the system has a sensitivity of about ± 3.85 parts in 10 to the 9th power when the sampling time is 0.008 second. The limitng factor of the sensitivity figure is shown to be the multiplier. (Author)

AD-261 510 Div. 30, 15
(21 Aug 61) OTS price $14.50

Air Battle Analysis Div., Dept. of the Air Force, Washington, D. C.
THE DAMAGE AND CONTAMINATION MODEL. VOLUME FOUR, PART I.
1961, 218p.
Unclassified report

DESCRIPTORS: *Contamination, Mathematical analysis, Probability, Targets, *Computers, Mathematical prediction, Applied mathematics, *Coding, Explosion damage, Radiation damage, Air raid casualties, *Programming, *Data processing systems, Sequences, Data storage systems.

AD-261 511 Div. 30
(21 Aug 61) OTS price $19.75

Air Battle Analysis Div., Dept. of the Air Force, Washington, D. C.
THE DAMAGE AND CONTAMINATION MODEL. VOLUME FOUR, PART II.
1961, 301p.
Unclassified report

DESCRIPTORS: *Contamination, Mathematical analysis, Probability, Targets, *Computers, Mathematical predictions, Applied mathematics, *Coding, Explosion damage, Radiation damage, Air raid casualties, *Programming, *Data processing systems, Sequences, Data storage systems.

AD-261 512 Div. 30, 15
(21 Aug 61) OTS price $10.50

Air Battle Analysis Div., Dept. of the Air Force, Washington, D. C.
THE DAMAGE AND CONTAMINATION MODEL. VOLUME TWO.
1961, 134p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Contamination, Mathematical analysis, Probability, Targets, *Computers, Mathematical predictions, Applied mathematics, *Coding, *Explosion damage, *Radiation damage, Air raid casualties, *Programming, *Data processing systems, Sequences, Data storage systems.

AD-261 513 Div. 30
(21 Aug 61) OTS price $11.00

Air Battle Analysis Div., Dept. of the Air Force, Washington, D. C.
THE DAMAGE AND CONTAMINATION MODEL. VOLUME THREE.
1961, 145p. incl. illus.
Unclassified report

DESCRIPTORS: *Contamination, Mathematical analysis, Probability, Targets, *Computers, Mathematical prediction, Applied mathematics, *Coding, *Explosion damage, *Radiation damage, Air raid casualties, *Programming, *Data processing systems, Sequences, Data storage systems.

AD-261 586 Div. 30
(21 Aug 61) OTS price $3.60

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
AUTOMATIC DATA PROCESSING SYSTEM MINIMAL INFORMER.
Quarterly progress rept. no. 8, Dec 60-May 61 on Design and Development of a Minimal Informer Engineering Test Model,
by Gilbert O. Boehm, Robert F. Keating, and others. 31 May 61, 32p. incl. illus.
(Contract DA 36-039-sc-78220, Proj. 3-B-28-02-001-01)

Unclassified report

DESCRIPTORS: *Data processing systems, Automatic, Design, Tests, Test equipment, Magnetic tape, Data storage systems.

This report defines the objectives of the revised contract and presents the work accomplished during the report period. The progress made in the design and evaluation in each of the logic areas of the Minimal INFORMER System is reported. The report also contains the conclusions drawn from the work performed during this report period, intended work for the next period, and a list of key personnel and the approximate man-hours devoted by each to this project. (Author)

AD-261 592 Div. 30, 22
(5 Sep 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
A HIGH-PRESSURE LIGHT-GAS GUN,
by Leon Horn. 26 July 61, 23p. incl. illus.
(DOFL rept. no. TR-932)
(Proj. no. 30300)

Unclassified report

DESCRIPTORS: Guns, *Hypervelocity guns, Design, Operation, Shock waves, *Shock tubes, Solids, Impact shock, Velocity, Measurement, Gases, Pressure, Ballistics, Test facilities, Tests.

A new single-stage, high-pressure, stainless-steel, light-gas gun 30 ft long with a 1 3/8-in. bore has been designed and built at DOFL. This gun has driven a 6-gm mass at velocities above 5000 fps. With alterations made to heat the driver section, it is expected to give velocities of over 8000 fps and make possible impact shock pressures of more than 1-megabar. A comparison of the measured and computed projectile velocities at room temperature as well as higher temperatures is included. (Author)

AD-261 619 Div. 30
(21 Aug 61) OTS price $1.60

Technical Operations, Inc., Burlington, Mass.
PROGRAMMED PARALLEL COMPUTATION SEQUENCES,
by T. E. Cheatham, Jr. and G. O. Collins, Jr.
Aug 60, 8p. incl. illus.
(Contract AF 33(600)35190)

Unclassified report

DESCRIPTORS: *Digital computers, *Programming, Coding, Automatic, Sequences.

Facilities for paralleling input/output operation with computation are available in most modern computers; indeed, facilities for paralleling several computation sequences are available in a few computers at the present time and are projected for many new computers. It is possible to derive many of the benefits of parallel computation sequences by using a sequential computer which has parallel input/output facilities in conjunction with appropriate programming system design. The design for the CL-II Programming System incorporates features for simulating the availability of parallel computation sequences. (Author)

AD-261 623 Div. 30, 15
(21 Aug 61) OTS price $2.60

Technical Operations, Inc., Burlington, Mass.
PARALLEL PROGRAMMING,
by Paul Richards. Aug 60, 25p. incl. illus.
(Rept. no. TO-B60-27)
(Contract AF 33(600)35190)

Unclassified report

DESCRIPTORS: *Computers, *Programming, Algebra, Topology, Numerical methods and procedures, Computer logic, Mathematical analysis, *Digital computers.

About the only method of meeting an immediate need for greater computer speed is to resort to parallel processing. Since parallel computations do not introduce any new logical capabilities but do necessarily introduce additional programming effort, a serial computer of sufficient speed would probably always be preferable to a truly parallel computer. But since sufficiently fast serial computers may not be always available when needed, it appears urgent to study the problems and possibilities that are associated with truly parallel computers. The general problem is briefly defined as follows. A number of tasks, each with an associated execution time, is presented along with a (partial) set of restrictions on the sequencing of the various tasks. Except for these restrictions, the computer is capable of handling up to nu of these tasks simultaneously. Given these data, such things are determined as the minimum execution time, the efficiency with which the parallel computing possibilities can be used, and the manner in which these quantities vary with nu and with the topology of the sequencing restrictions. (Author)

AD-261 624 Div. 30, 15
(21 Aug 61) OTS price $3.60

Technical Operations, Inc., Burlington, Mass.
AN ALGEBRAIC LANGUAGE FOR FLOW CHARTS,
by Stephen Warshall. Aug 60, 34p. incl. illus.
(Rept. no. TO-B-60-33)
(Contract AF 33(600)35190)

Unclassified report

DESCRIPTORS: Computers, *Programming, *Coding, *Algebra, Language, Matrix algebra, Algebras.

An informal exposition is given of an algebraic language in which to describe flow charts. The assumption by machines of some of the programming tasks still performed by humans - the isolation of sub-routines, the design of test problems, the allocation of sections of a process to different controls or storage media, for example - rests in part on the development of adequate languages in which to indicate program structure. There is, moreover, possible application for such languages in the formal simplication and analysis of large computer games. (Author)

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-261 625 Div. 30, 15
(21 Aug 61) OTS price $1.60

Technical Operations, Inc., Burlington, Mass.
HANDLING FRACTIONS AND N-TUPLES IN THE ALGEBRAIC LANGUAGE L SUB S.
by T. E. Cheatham, Jr. 19 Aug 60, 11p. (Rept. no. TO-B 60-36)
(Contract AF 33(600)35190)
Unclassified report

DESCRIPTORS: *Data processing systems, *Digital computers, *Programming, Automatic, Coding, Algebra, Language.

The elements and collections of elements with which language L sub s deals are discussed. A detailed discussion is given of the handling of fractions and n-tuples. Techniques are described for providing facilities for handling fractions and n-tuples in the (initial) translator and code-generator portions of the compiler for language L sub s. (Author)

AD-261 626 Div. 30
(21 Aug 61) OTS price $8.10

Technical Operations, Inc., Burlington, Mass.
DISPLAY SYSTEMS FOR DIGITAL SIMULATIONS,
by Peter Kugel. 30 Sep 60, 77p. incl. illus.
(Rept. no. TO-B 60-40)
(Contract AF 33(600)35190)
Unclassified report

DESCRIPTORS: *Digital computers, Digital systems, Computers, Specifications, Human engineering, Simulation, Programming.

This report deals with systems to help human beings interpret the outputs of digital computers by having machines perform many of the more mechanical tasks involved in interpretation. The aims of such systems and the capabilities which they should have to accomplish these aims are considered. The report also suggests general specifications for a particular system, provides a framework within which this system can be dealt with further, and contains some suggestions for implementing construction. (Author)

AD-261 710 Div. 30, 15
(23 Aug 61) OTS price $8.10

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
(No title).
Technical rept.,
by J. H. Holland and J. W. Crichton. July 61, 87p. 23 refs. (Rept. no. 04274-3-T)
(Contract DA 36-039-sc-87174)
Unclassified report

DESCRIPTORS: Theory, *Computers, *Data processing systems, *Mathematical logic, *Information theory, Biology, Classification, *Programming, Sampling, Sequences, Biological environment, Automation, Automatic, *Cybernetics, Statistical processes, Biophysics.

This report includes:
A LOGICAL THEORY OF ADAPTIVE SYSTEMS INFORMALLY DESCRIBED, by J. H. Holland. July 61, 51p.
(Contract DA 36-039-sc-87174)

ON THE DISTINCTION BETWEEN LIVING AND NON-LIVING SYSTEMS, by J. W. Crichton. July 61, 33p.
(Contract DA 36-039-sc-87174)

AD-261 711 Div. 30
(23 Aug 61) OTS price $1.10

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
A THEORY OF ADAPTIVE SYSTEMS.
Quarterly progress rept. no. 2, 1 Feb-30 Apr 61. June 61, 2p. (Rept. no. 04274-2-P)
(Contract DA 36-039-sc-87174)
Unclassified report

DESCRIPTORS: Automation, Theory, *Computers, *Programming, Cybernetics, Automatic.

An attempt is being made to provide a detailed example of an adaptive system. A particular subclass of adaptive systems has been defined. This sub-class has been chosen so that it should possess some of the critical adaptive properties described in the informal paper. The specific, detailed rules for the iterative circuit computer underlying this class of adaptive systems are being worked out and set down. Theoretical properties for adaptive systems in general are being sought. Attempts are being made to obtain theorems applicable to the very general classes of adaptive systems. One such attempt is the following: using the iterative circuit computer characterization of adaptive systems, to determine the maximum learning which can be expected from an adaptive system as a function of the amounts of information provided from the environment. (Author)

AD-261 741 Div. 30, 8, 12
(22 Aug 61) OTS price $7.60

Space Technology Labs., Inc., Los Angeles, Calif.
DIGITAL COMPUTER SYSTEMS STUDIES.
Semiannual rept., 1 Jan-30 June 61,
by T. Winkler. 30 June 61, 73p. incl. illus. tables (Rept. no. 7203-0004-NU-000)
(Contract AF 04(647)619)
(AFBMD TN 61-41) Unclassified report

DESCRIPTORS: *Digital computers, Data processing systems, Digital systems, *Data storage systems, Magnetic cores, Memory devices, *Delay lines, *Electronic circuits, Switching circuits, Packaging, Computers, Delay circuits, Trigger circuits, *Guided missiles, *Guidance, Programming, Analog to digital converters, Magnetostrictive elements, Feedback amplifiers, Design, Tests, Surface to surface, *Guided missile computers.

The report is divided into four sections detailing the following study areas: (1) Storage Media, (2) Input-Output Circuits, (3) Circuit Building Blocks, and (4) Packaging. Work continued on delay lines, magnetic drums, core rope and core stack memories. Various breadboards and other models were built and tested. Specific error sources in the stairstep ramp generator were analyzed, and the feasibility of operating a Shannon Rack Decoder at 250 kc was investigated. Packaging methods and techniques were refined, especially with respect to the circuit modules and their interconnection. (Author)

AD-261 817 Div. 30, 14, 25
(22 Aug 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW WAYS OF INVESTIGATING LUBRICANTS (Novye Puti

Issledovaniya Smazok),
by G. V. Vinogradov. 26 June 61, 10p. incl. illus.
(Trans. no. MCL-1105 of Vestnik Akademii Nauk SSSR 31:48-53, 1 Jan 61)
Unclassified report

DESCRIPTORS: *Lubricants, *Friction, Test equipment, *Machines, Design, *Laboratory equipment, USSR, Test methods, Effectiveness.

Two friction machines were designed to investigate the effectiveness and mechanism of action of lubricants under conditions of rolling and boundary sliding friction. Various forms of friction can be studied on these machines at temperatures of up to 800 degrees in open air, in the presence of various gases, and in deep vacuum. The rotation rate of one of the friction surfaces varies from 1.5 x 10 to the -4th power to 3200 rpm. The loads applied to the friction surfaces vary from 5 to 500 kg, which corresponds to the possibility of conducting experiments at contact pressures ranging from several to 50,000 kg/sq cm. Results of tests conducted with these machines indicated that at boundary friction of metals (steel) hydrocarbon lubricating media in the absence of O and O-containing organic compounds do not develop the lubricating effect.

AD-261 851 Div. 30, 15
(24 Aug 61) OTS price $8.60

Cruft Lab., Harvard U., Cambridge, Mass.
A STUDY OF THE OPTIMAL CONTROL OF DYNAMIC SYSTEMS.
Doctoral thesis,
by Yu-Chi Ho. 10 Feb 61, 98p. incl. illus.
31 refs. (Technical rept. no. 335)
(Contract Nonr-186616, Proj. NR-372-012)
Unclassified report

DESCRIPTORS: *Cybernetics, *Control systems, Computers, Mathematical computer data, Differential equations, Matrix algebra, Integral transforms, *Linear programming, Digital systems, Mathematical analysis.

In this report, we study the problem of controlling the behavior of a general dynamic system subject to various physical constraints. The class of dynamic systems considered is assumed to obey the linear vector differential equation x equals Fx + Du , x(0) equals c where x is an n-vector called the state vector, F is a nxn matrix of constant elements, D is a nxr matrix of constant elements, u is a r-vector called the control vector. The constraints stipulated are, u(t) equals u(iT) for iT is less than or equal to t which is less than (i + 1)T and the absolute value of u(t) is less than or equals to 1 for t greater than or equal to i.e., the control vector is constrained to be piecewise constant and amplitude limited. We are interested in the determination of u(t) subject to (ii) or (iii) of both such that the state vector x(t) attains the value zero in minimum time or the integral of some measure of the vector is a minimum over a period of time. A well-known example of this class of problems is the so-called bang-bang control problem. (Author)

AD-261 867 Div. 30
(24 Aug 61) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPECIAL PROCEDURES FOR THE LINCOLN 709/7090 VERSION.
Supplement to Information Processing Language V (IPL-V) Manual,
by Bert F. Green, Jr., and Alice K. Wolf.
4 Aug 61, 40p. (Rept. no. 58G-0024)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Data processing systems, Coding, Language, *Machine translation, Programming.

AD-261 873 Div. 30, 25
(23 Aug 61) OTS price $1.10

Massachusetts U., Amherst.
COMPUTER PROGRAMS FOR LIGHT SCATTERING DATA PROCESSING,
by R. S. Stein, S. N. Stidham, and P. R. Wilson.
10 July 61, 10p. incl. table.
(Contract Nonr-335700, Proj. NR 356-378)
(ONR TR 34) Unclassified report

DESCRIPTORS: *Light, Scattering, Digital computers, *Programming, Corrections, Polarization, Reflection, Refraction, Data processing systems, Computers.

Procedures for correcting light scattering data from thin polymer films for scattering volume, reflection, refraction and secondary scattering and modifications necessary using polarized light are discussed. These procedures are somewhat cumbersome and involve extensive graphs of correction factors for ranges of the scattering angles. Techniques using an IBM 1620 computer have been developed to facilitate correction procedures. (Author)

AD-261 902 Div. 30, 25
(24 Aug 61) OTS price $1.10

Uppsala U. (Sweden).
A MICROSCOPE FOR THE SCANNING OF NUCLEAR RESEARCH EMULSIONS,
by A. G. Ekspong and B. E. Ronne. 1961, 7p. incl. illus.
(Contract AF 61(052)13)
(AFOSR TN 59-411) Unclassified report

DESCRIPTORS: *Microscopes, Nuclear physics, Laboratory equipment.

A microscope which can handle rather large plates is described. The area which can be reached without moving the plate is 25 x 15 centimeters. The largest plate which can be examined on the microscope must have one side less than 49 centimeters. The use of the microscope is made comfortable by suitably constructed manual controls. The stage can be moved rapidly and precisely. (Author)

AD-261 951 Div. 30, 22
(25 Aug 61) OTS price $4.60

Ordnance Tank-Automotive Command, Detroit, Mich.
DIGITAL COMPUTER PROGRAM FOR CONVENTIONAL BALLISTIC EVALUATION,
by Mary Archambault. 6 Apr 61, 40p. incl. illus. tables (Rept. no. RR-34)
Unclassified report

DESCRIPTORS: Computers, *Digital computers, *Programming, Simulation, Mathematical analysis, Mathematical computer data, Range finding, Tanks, Armored vehicles, *Armor, Vulnerability, Thickness, *Terminal ballistics, Penetration, Determination, Deflection, Ballistics.

A high speed digital computer program was developed for (1) determining the range at which an armored vehicle is vulnerable to rounds striking a specified point on its surface, and for (2) determining the armor thickness required for protection at a specified range and angle of attack. (Author)

AD-262 011 Div. 30
(28 Aug 61) OTS price $2.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
TEST AND EVALUATION OF A DIGITAL CLOCK FOR REAL-TIME COMPUTER OPERATION.
Final rept.,
by William G. Brown. Apr 61, 21p. incl. illus.
Unclassified report

DESCRIPTORS: *Digital computers, *Time interval counters, Digital systems, Electric clocks, Tests, Errors, Effectiveness, Test equipment, *Time, Programming, Computers.

Tests and evaluations were performed utilizing a Remington Rand UNIVAC digital clock with the UNIVAC file computer system. The purpose of the clock is to provide a stable timing signal necessary to a computer program, which requires referencing to real time. Programs of this nature, would be automatic readouts of flight plan data based on real time, originating messages for transmittal to other facilities, and the erasing or recording of data based on real time. Incorporation of the digital clock will reduce the amount of inter/intra-facility coordination. Results indicated that the digital clock is applicable to the system in performing the functions intended. During the initial test, invalid data could be contained in the clock register and would not be detected until the next attempt to access the clock register. This required engineering changes to the clock circuitry which were made by connecting the clock error to the main computer error circuitry. These changes provided immediate detection of invalid data in the clock register and allowed the normal error system to function as programmed. The final results indicated that, the digital clock performed most reliably and satisfactorily for the Phase I UNIVAC file computer system. (Author)

AD-262 202 Div. 30, 26
(30 Aug 61) OTS price $1.60

Watertown Arsenal Labs., Mass.
DETERMINATION OF FLAW GEOMETRY BY ULTRASONIC PULSE CONTOUR AND SPECTRUM ANALYSIS.
Technical rept. on Research of Materials for High Temperature Use,
by John J. Maguire. July 61, 14p. incl. illus.
(WAL TR 830.5/2)
Unclassified report

DESCRIPTORS: *Non-destructive testing, *Ultrasonics, Ultrasonic spectrum analysis, Test equipment, *Test facilities, Fracture (Mechanics), Configuration, Grains (Metallurgy), Quality control, Determination, Detection.

The report describes the application of ultrasonic pulses of almost rectangular envelope to pulse-echo testing, resulting in the simultaneous transmission of a wide band of ultrasonic frequencies. In comparison to the essentially monochromatic ultrasound used in conventional test systems, this method permits the derivation of additional information from the test, obtained in the form of the spectral energy distribution after reflection from the defect. Besides determining the location of a flaw, it is now possible to gather data representing the flaw geometry. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-261 744 Div. 31
(22 Aug 61) OTS price $10.50

David Taylor Model Basin, Washington, D. C.
INTERNATIONAL SHIP STRUCTURES CONGRESS REPORT OF THE COMMITTEE ON RESPONSE TO WAVE LOADS.
June 61, 134p. incl. illus. tables, 58 refs.
(Rept. no. 1537)
Unclassified report

DESCRIPTORS: *Ship hulls, Load distribution, Stresses, Determination, Water waves, Moments, Statistical data, Measurement, Strain gages, Motion, Recording devices.

AD-262 232 Div. 31, 30
(30 Aug 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
EXPERIMENTAL PERFORMANCE OF TMB SUPERCAVITATING PROPELLERS 3767, 3768, 3769, 3770, 3785, and 3820,
by Richard Hecker and J. G. Peck. Aug 61, 20p. incl. illus. table (Rept. no. 1553)
Unclassified report

DESCRIPTORS: *Marine propellers, Cavitation, Model tests, Thrust, Torque, Velocity, *Water tunnels, Water, Pressure, Pitot tubes, Dynamometers, Manometers, Measurement, Design, Hydrodynamics.

Six TMB 3-bladed supercavitating propellers were tested for powering performance in the 24-inch variable pressure water tunnel at several cavitation indices over a range of speed coefficients. The thrust, torque, and rpm were measured with the 150-hp dynamometer. The water velocity during the tests was measured with a pitot tube mounted in the plane of the propeller blade centerline at a radial distance of ten in. from the shaft centerline. The pitot tube openings are connected to a mercury monometer allowing the average water speed to be measured within + or - 0.1 fps. The tunnel pressure is also measured by means of mercury monometers. A telescopic sight is provided for reading the mercury level. In this way the tunnel pressure can be maintained to within + or - 0.01 psi. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-261 591 Div. 32, 15
(6 Sep 61) OTS price $7.60

Princeton U., N. J.
COMPETITION THROUGH THE INTRODUCTION OF NEW

PRODUCTS.
Rept. on Econometric Research Program,
by Robert Reichardt. 10 July 61, 72p. incl. illus. tables (Research memo. no. 28)
(Sponsored by the Office of Naval Research, Carnegie Corp., N. Y., and Rockefeller Foundation)
Unclassified report

DESCRIPTORS: Production, *Economics, *Games theory, Costs, *Industrial production, Mathematics.

Competitive situations among oligopolists who intend to introduce similar new products are studied. Game-theoretical models are developed in which one or two of the following parameters are specified as strategic variables: starting time for development research, expenditure for research, size of new equipment, advertising costs, and price-supply policies. Equilibria are obtained in several models by the use of the Nash equilibrium point theory for non-cooperative games. For the treatment of competition through the price-supply policies, a dynamic model is developed using the new approach to demand theory as formulated by Morgenstern. Cooperation among firms which are willing to introduce similar new goods is considered. Here cooperation takes place in the form of patent releases. In the first model, the starting time for research as well as willingness to cooperate are parameters of action; in the second model the behavior during the negotiations influences the payoffs. In both cases non-cooperative equilibria in the sense of Nash are obtained. Bargaining schemes for fixing side payments (in this case patent royalties) are studied. The phonograph record and the chemical industry are examples of industries which introduce large numbers of new products either in a short time period or at the same time. A study of the case in which the number of new products per time unit can be varied is discussed. (Author)

AD-261 828 Div. 32
(22 Aug 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCIENTIFIC LIFE. SCIENTIFIC CONFERENCE AT THE KUYBYSHEV AVIATION INSTITUTE (Nauchnaya Konferentsiya V Kuybyshevskom Aviatsionnom Institute),
by D. N. Lysenko. 27 June 61, 5p. (Trans. no. MCL-1157 of Izvestiya Vysshikh Uchebnykh Zavedeniy, Ministerstvo Vysshego Obrazovaniya, SSSR, Seriya Aviatsionnaya Tekhnika 2:152-154, 1959)
Unclassified report

DESCRIPTORS: *Symposia, Conferences, *Political science, USSR, Scientific research.

AD-262 224 Div. 32, 2
(1 Sep 61) OTS price $3.60

California U., Berkeley.
NOTES ON THE CHIRIQUI LAGOON DISTRICT AND ADJACENT REGIONS OF PANAMA. II.
by Burton LeRoy Gordon. 1961, 28p. incl. illus. 14 refs.
(Contract Nonr-22211, Proj. NR 388-067)
Unclassified report

DESCRIPTORS: *Panama, *Culture, Anthropology, Rural areas, Sociology, Population, Language, Housing, Archaeology, Economics, Food, Geography, Trees, Food.

AD-262 225 Div. 32
(1 Sep 61) OTS price $6.60

California U., Berkeley.
STUDIES IN THE FOOD SUPPLY OF EL SALVADOR,
by John Thompson. Mar 61, 64p. incl. tables.
(Contract Nonr-22211, Proj. NR 388-067)
Unclassified report

DESCRIPTORS: *Food, Fruits, Cereals, Vegetables, Swine, Beef, Corn, Rice, *Production, *Distribution, *Agriculture, Wheat, Supplies, Meat, *Economics, *Central America.

AD-262 294 Div. 32, 16
(10 Aug 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
BARK AND ITS POSSIBLE USES.
rev. June 61, 16p. incl. tables, 16 refs. (Rept. no. 1666-5)
Unclassified report

DESCRIPTORS: Trees, Lignin, *Fibers, *Wood, Plants, Physiology, Industry, Tissues (Biology), Chemical properties, Waxes, *Forestry.

Contents:
Bark structure
Bark utilization
Low-grade utilization
Use of bark in the soil
Physical upgrading of bark
Chemical upgrading of bark

33. TRANSPORTATION

No Entries

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk will be included in the cumulative indexes.

BIBLIOGRAPHY

TID-3043(Rev. 1)(Suppl. 2) $1.75

Office of Technical Information Extension, Atomic Energy Commission, Oak Ridge, Tenn.
BIBLIOGRAPHIES OF INTEREST TO THE ATOMIC ENERGY PROGRAM, comp. by James M. Jacobs, Naomi K. Smelcer, and Hugh E. Voress. Jan 61, 68p.

ASTRONOMY

PB 161 607 $2.00

National Bureau of Standards, Boulder, Colo.
THE INTEGRATED STARLIGHT OVER THE SKY, by Lawrence R. Megill and Franklin E. Roach. June 61, 90p. 6 refs. Technical note no. 106.

DESCRIPTORS: Light, Measurement, *Sky brightness, Upper atmosphere, *Stars, Tables, *Galaxies, Solar systems, Astrophysics, Visibility, *Night sky.

This Technical Note represents an extension of work published earlier. The amount of light coming from stars of each magnitude from m = 6 to 18 is presented for every 10^{o} in galactic longitude and galactic latitudes 0^{o}, -2^{o}, $\pm5^{o}$, $\pm10^{o}$, $\pm15^{o}$, $\pm20^{o}$, $\pm30^{o}$, $\pm40^{o}$, $\pm60^{o}$, $\pm70^{o}$ and $\pm80^{o}$. In addition the total integrated starlight at each of these points is given, using an extrapolation technique to estimate the contribution from stars of magnitude greater than 18. Attention is called to systematic differences between the total integrated starlight based on star counts and recently measured values by Elsässer and Haug. A table converting from galatic to ecliptic and equatorial coordinates is given for convenience. (Author)

BEHAVIORAL SCIENCES

PB 153 423 $6.60

[Research Inst.] U. of Michigan, Ann Arbor.
HUMAN DISCRIMINATION OF AUDITORY DURATION, by C. D. Creelman. Technical rept. no. 114 on Contract AF 19(604)2277; Rept. no. 7 on Speech Research Lab., U. of Michigan, Contract Nonr-1224(22). Oct 60, 66p. 63 refs. UMRI rept. no. 2659-11-T; AFCCDD TR 60-39; AD-247 384.

DESCRIPTORS: *Auditory perception, Auditory signals, *Statistical analysis, Test methods, Theory, Memory, Probability, Transformations (Mathematics), *Psychoacoustics, Reasoning.

A set of experiments was conducted in which base time, increment time, and signal level were the independent variables. A two-alternative forced-choice procedure was used throughout, and the results were interpreted within a framework which views discrimination as a statistical decision-making process. The model developed within this framework required the estimation of two constants for each observer, and with these constants accurate prediction could be made over quite a wide range of experimental conditions. (Author)

Personnel and Training

PB 158 124-1 $7.60

American Inst. for Research, Washington, D. C.
SITUATIONAL PROBLEMS FOR LEADERSHIP TRAINING: PART I. DEVELOPMENT AND EVALUATION OF SITUATIONAL PROBLEMS, by Theresa G. Trittipoe and Clifford P. Hahn. Final rept. on Contract Nonr-2838(00). Mar 61, 75p. 2 refs. AIR-B98-61-FR-253(I); AD-254 818.

DESCRIPTORS: *Military training, *Training, *Leadership, Naval personnel, Behavior, Tests, Test methods.

Fifteen situational problems were developed and evaluated. The results of administering the problems in both role playing and case study formats are described and discussed. (Author) (See also AD-255 015)

PB 158 124-2 $10.50

American Inst. for Research, Washington, D. C.
SITUATIONAL PROBLEMS FOR LEADERSHIP TRAINING: PART II. SITUATIONAL PROBLEMS FOR ROLE PLAYING AND CASE STUDY USE. Final rept. on Contract Nonr-2838(00). Mar 61, 140p. AIR-B98-61-FR-253(II); AD-254 819.

DESCRIPTORS: *Leadership, *Training, Tests, *Military training, Naval personnel, Behavior, Test methods.

This report contains the final forms of the problem materials: both role playing and case study materials are included. Directions are provided for administering the materials and conducting the discussions. (Author) (See also PB 158 124-1)

PB 158 124-3 $5.60

American Inst. for Research, Washington, D. C.
SITUATIONAL PROBLEMS FOR LEADERSHIP TRAINING: PART III. REVIEW FOR PETTY OFFICERS OF LEADERSHIP RESEARCH, by Clifford P. Hahn and Theresa G. Trittipoe. Final rept. on Contract Nonr-2838(00). Mar 61, 51p. 19 refs. AIR-B98-61-FR-253(III); AD-254 820.

DESCRIPTORS: *Leadership, *Training, Tests, *Military training, Behavior, Test methods.

Problems, results and trends in leadership research are described. Since this part is intended for use by Petty Officers it has been prepared with that audience in mind. The major emphases are on (1) introducing Petty Officers to the range of problem areas in leadership research; (2) indicating in general terms what results have been obtained regarding these problems; and (3) stimulating their interest in the human relations aspects of leadership. (Author) (See also PB 158 12402)

PB 156 570 $2.60

Personnel Lab., Wright Air Development Div., Lackland AFB, Tex.
AN APPLICATION OF THE HIERARCHICAL FACTOR MODEL TO THE CRITERION GROUPING PROBLEM, by Ernest C. Tupes, Leland D. Brokaw, and Margorie N. Kaplan. Sep 60, 24p. 4 refs. WADD-TN-60-219; AD-253 013.

DESCRIPTORS: *Aptitude tests, *Military personnel, *Factor analysis.

A hierarchical factor analysis was applied to intercorrelations of the validity coefficients of 14 aptitude tests for 66 technical school criteria. Seven factors emerged: a general, two second-order, and four first-order factors. From the implications of these results for airman classification, it was concluded that the present five aptitude indexes could probably be reduced to four with little loss in prediction; however, if the number of aptitude indexes were reduced below four, appreciable loss in prediction would occur. The present aptitude indexes could be reduced to four by combining the General and Electronics Aptitude Indexes. Some shifting in courses from one aptitude index to another is suggested. (Author)

PB 156 573 $1.60

Personnel Lab., Wright Air Development Div., Lackland AFB, Tex.
APPRAISAL OF EDUCATIONAL REQUIREMENTS FOR AIRMAN SPECIALTIES, by Chester J. Judy. Dec 60, 18p. 8 refs. WADD-TN-60-264; AD-252 253.

DESCRIPTORS: *Aviation personnel, *Education, Classification, Military requirements, Test methods, Statistical analysis.

Educational requirements for airman specialties are given in Air Force Manual 35-1. This study examines the role of some of these gross indicators of academic achievement in predicting technical school grades. Attention was restricted to the educational information shown on testing and assignment record cards completed for a sample of airmen in 13 Air Force specialties. By linear regression techniques it was found that the joint contribution of this limited amount of information permits the prediction of a large part of the variance in technical school grades. High school graduation was the best single predictor among the educational variables. Completion or noncompletion of particular high-school-level courses, although individually and generally predictive of the criterion measures, consistently did not reach a level of practical significance for any specialty when the effects of other information were controlled. Further validation of educational requirements for Air Force specialties should start with better basic information on academic achievement. (Author)

PB 156 572 $1.60

Personnel Lab., Wright Air Development Div., Lackland AFB, Tex.
A COMPARISON OF THREE METHODS OF RATING-SCALE CONSTRUCTION, by Joseph M. Madden. Nov. 60, 18p. 13 refs. WADD-TN-60-262; AD-252 251.

DESCRIPTORS: Aviation personnel, *Job analysis, Factor analysis, Effectiveness, Test methods, Statistical analysis, Analysis of variance, Reliability, Reasoning, *Psychometrics.

Four job evaluation factors were used as the basis of rating 10 Air Force specialties. For each factor three different methods were used in constructing the scale: (1) each scale division was defined and illustrated; (2) neither scale division definitions nor examples were used; and (3) definitions were used but the examples were omitted. Ratings by samples of aviation cadets were analyzed for effects of method on mean ratings. For three of the four factors, the mean ratings obtained were not different as a function of the method of scale construction. Methods 1 and 3 were about equally reliable, both yielding more reliable means than method 2. Method 3 is suggested as being the most effective because the task of the rater is somewhat simpler than for method 1 and the reliability is higher than for method 2. (Author)

PB 156 569 $2.60

Personnel Lab., Wright Air Development Div., Lackland AFB, Tex.
PREDICTION OF SUCCESS IN WAF BASIC TRAINING BY TWO BACKGROUND INVENTORIES, by Lois Lawrence Elliott. Sep 60, 21p. 4 refs. WADD-TN-60-216; AD-249 952.

DESCRIPTORS: *Selection, Air Force, *Adjustment (Psychology), *Military training, Personality tests, Military personnel, Aptitude tests, Group dynamics.

As part of a longitudinal study of WAF careers, the Biographical Inventory of the Airman Classification Battery and WAF Self Report Inventory were administered to a six months' input of WAF basic trainees. On the basis of item counts for half the sample, keys were developed to predict success in basic training. When cross validated against the remaining part of the sample, moderate validity was obtained for one group and negligible validity for the other. (Author)

PB 156 571 $2.60

Personnel Lab., Wright Air Development Div., Lackland AFB, Tex.
RELIABILITY OF JOB EVALUATION RATINGS AS A FUNCTION OF NUMBER OF RATERS AND LENGTH OF JOB DESCRIPTIONS, by Raymond E. Christal, Joseph M. Madden, and Francis D. Harding. Oct 60, 26p. 10 refs. WADD-TN-60-257; AD-251 837.

DESCRIPTORS: Aviation personnel, *Job analysis, Reliability, Effectiveness, Test methods, Reasoning, Statistical analysis, Factor analysis.

Reliabilities of single ratings and pooled ratings of Air Force job evaluation factors were estimated from ratings on 50 Air Force specialties by student officers attending the Command and Staff School. The Spearman Brown prophency formula was found to produce reliability estimates which were practically identical to those obtained by randomly drawing samples and computing the reliability for each one. The interrater and raterate reliability of the Air Force job evaluation system was found to be adequate when the composites were based upon an average of the ratings made by 10 to 15 officers at the School. The reliability of such mean ratings did not rise appreciably as the number of raters was increased beyond 20. When the basis of rating was a full-length job description, the raters tended to assign higher values than when they based their ratings on a brief Specialty Summary. However, the rank ordering of the specialties remained essentially unchanged. Reliability of the ratings was approximately the same whether long or short job descriptions were used. (Author)

PB 156 568 $5.60

Personnel Lab., Wright Air Development Div., Lackland, AFB, Tex.
SUGGESTED COMPOSITION OF AIRMAN CLASSIFICATION INSTRUMENTS, by Leland D. Brokaw. Aug 60, 54p. 9 refs. WADD-TN-60-614; AD-252 252.

DESCRIPTORS: *Aviation personnel, Classification, *Psychometrics, *Aptitude tests, Statistical analysis, Effectiveness

Each test of Airman Classification Battery AC-2A was evaluated for its contribution to Air Force classification procedures. Criteria were success in Air Force technical training and scores achieved on job proficiency tests. By a multiple regression technique standar beta weights and a squared multiple correlation coefficient were derived for 16 predictors against both criteria for 36 criterion groups. Components for four aptitude indexes were selected by reviewing the frequen with which tests appeared among the best four predictors within each of four job clusters. (Author)

BIOLOGICAL SCIENCES

PB 150 905 $1.60

Rome Air Development Center, Griffiss AFB, N. Y.
TAPPING THE ELECTRICAL POWER OF THE NERVOUS SYSTEM FOR BIOLOGICAL TELEMETERING, by Lawrence R. Pinneo and Murray L. Kesselman. May 59, 17p. 31 refs. RADC-TN-59-15; AD-209 067.

DESCRIPTORS: *Nervous system, Electrical properties, *Telemetering transmitters, Operation, Physiology, Anatomy.

Two experiments are reported wherein electric power is measured from the central nervous system (CNS) of a living mammal, and an FM radio transmitter is operated on voltages supplied largely by the organism. Also discussed are the neurophysiological basis of the CNS currents, the physical characteristics of minimum voltages necessary to operate transistors, and a description of methods of combining the two techniques for biological telemetering. (Author)

Anatomy and Physiology

PB 154 514 $1.10

Quartermaster Research and Engineering Command, Natick, Mass.
HEAT PRODUCTION FROM SHIVERING, by P. F. Iampietro, J. A. Vaughan and others. Jan 61, 10p. 11 refs. Technical rept. EP-145; AD-252 092.

DESCRIPTORS: *Exposure, *Shivering, *Heat production (Biology), Wind, Climatic factors, Temperature, Oxygen consumption, *Body temperature, Military personnel.

Healthy young men were exposed, nearly nude, for 2 hours or less to various environmental conditions (dry bulb temperature, 90 to 20 F; windspeed, < 1, 5, 10 mph). Oxygen consumption was recorded at intervals during exposure. Exposure to very low temperatures (20 F) with low winds did not evoke the largest increases in heat production. The greatest mean heat production (370 Cal/hr) was associated with the highest windspeed (10 mph) and this value approached the maximum heat production which can be attained by shivering (mean value about 425 Cal/hr). Thus, increasing the windspeed had a relatively greater impact on heat production than decreasing the dry bulb temperature. The relationships between heat production and windspeed and heat production and dry bulb temperature were non-linear. (Author)

PB 154 548 $1.60

Quartermaster Research and Engineering Command, Natick, Mass.
THE INFLUENCE OF THERMAL-PROTECTIVE ENSEMBLES ON PHYSIOLOGICAL STRESS IN A DESERT ENVIRONMENT, by Harold E. Hanson and Thomas E. Dee, Jr. Feb 61, 19p. 8 refs. Technical rept. EP-146; AD-253 202.

DESCRIPTORS: *Stress (Physiology), *Heat, *Protective clothing, *Perspiration, Heart, Climatic factors, Deserts, Measurement, Blood circulation, *Body temperature.

Sweat production, rectal temperatures, and pulse rates were measured, over a 24 consecutive day period on 9 man while resting or walking in a natural desert summer environment, to assess the heat stress imposed while wearing either a conventional ensemble or thermal-protective ensembles. During rest no significant physiological differences occurred while wearing the various ensembles. During activity (walking) thermal-protective ensembles imposed significantly higher stress levels on the individual than did the conventional ensemble. For example, when the Large Spacer ensemble, with all external vents closed, was worn, rectal temperatures were 101.8 F during the first hour of walking. (Author)

PB 154 513 $1.60

Quartermaster Research and Engineering Command, Natick, Mass.
MANUAL PERFORMANCE AS A FUNCTION OF RATE OF CHANGE IN HAND SKIN TEMPERATURE, by R. E. Clark and A. Cohen. Jan 61, 14p. 16 refs. Technical rept. EP-144; AD-251 936.

DESCRIPTORS: Psychomotor tests, Physiology, *Body temperature, *Motor reactions, Hands, Exposure, Heating, Skin, Tests.

Performance time on a knot-tying task was obtained for twenty enlisted men during cooling and subsequent rewarming of the hands to different hand skin temperature levels. Two rates of hand cooling were used while body temperature, other than the hands and forearms, was maintained at normal. The results are summarized as follows: (1) performance decrement observed at different hand skin temperatures was less for fast cooling of the hands than for slow cooling; (2) rate of rewarming was directly related to rate of cooling; (3) slow cooling was associated with a sizeable and significant performance decrement even after the hands had rewarmed to normal; and (4) fast cooling was associated with a complete loss of performance decrement when the hands rewarmed to normal. (Author)

Biochemistry

TID-12830 $1.10

Chicago U., Ill.
THE GENETIC FUNCTIONING OF HETEROCHROMATIN. Final rept. on Contract AT(11-1)-431. 8p.

TID-13052 $1.60

[Creighton U. School of Medicine, Omaha, Neb.]
Ca-45 AND Sr-85 METABOLISM IN MAN. Progress rept. on Contract AT(11-1)-587. 20 May 60-1 June 61. 26 June 61, 12p.

Radiobiology

UCLA-477 $1.60

California U. School of Medicine, Los Angeles
MEASUREMENT OF LIVER BLOOD FLOW IN ANIMALS WITH COLLOIDAL RADIOGOLD (Au^{198}) by O. M. Meredith, William Coffman and others. Rept. on Contract AT(04-1)-GEN-12. 12 June 61. 21p.

UCLA-478 $3.60

California U. School fo Medicine, Los Angeles
RECENT USES OF A TOTAL BODY COUNTER FACILITY IN METABOLIC RESEARCH AND CLINICAL DIAGNOSIS WITH RADIONUCLIDES, by Norman S. MacDonald. Rept. on Contract AT(04-1)-GEN-12. 16 June 61, 31p.

HW-SA-1957 $1.60

Hanford Atomic Products Operation, Richland, Wash.
INADEQUACIES OF MPC'S FOR CONTROL OF RADIATION IN THE ENVIRONMENT, by R. F. Foster. Rept. on Contract AT(45-1)-1350. [1959] 19p.

LAMS-2526 $22.25

Los Alamos Scientific Lab., N. Mex.
BIOLOGICAL AND MEDICAL RESEARCH GROUP (H-4) OF THE HEALTH DIVISION, Semiannual rept. no. 3, July-Dec 60 on Contract W-7405-eng-36. Jan 61, 414p.

LA-1468 $1.10

Los Alamos Scientific Lab., N. Mex.
THE SPECIFIC ACTIVITY OF TRITIUM IN THE ORGANIC COMPONENTS OF THE SKIN AND FAT OF MAN FOLLOWING EIGHT MONTHS' CHRONIC EXPOSURE TO HTO IN BODY FLUIDS, by Ernest A. Pinson, Ernest C. Anderson, and Virginia Lotz. Oct 52; declassified 1 June 63. 8p.

TID-3565 $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
RADIOSTERILIZATION OF EDIBLE FISH, MOLLUSKS AND CRUSTACEANS, comp. by Theodore F. Davis. A Literature search. Aug 61, 12p.

NYO-9633 $1.60

Tufts U. School of Medicine, Boston, Mass.
FINAL CONTRACT REPORT ON CONTRACT AT(30-1)-1673, by Richard Wagner. 22 May 61, 16p.

CHEMISTRY

NAA-SR-M-6064 $1.10

Atomics International, Canoga Park, Calif.
CALCIUM NITRIDE IN SODIUM, by Theron L. Mackay. 20 Jan 61, 8p.

HW-67574 $1.60

Hanford Atomic Products Operation, Richland, Wash.
CATION EFFECTS ON THE DISTRIBUTION OF URANIUM IN THE SYSTEM: ALUMINUM-ALUMINUM CHLORIDE-ALKALI CHLORIDE, by R. H. Moore. Rept. on Contract AT(45-1)-1350. 28 Nov 60, 19p.

HW-67772 $2.60

Hanford Atomic Products Operation, Richland, Wash.
SPECTRAL ANALYSIS OF MICROWAVE ACTIVATED CARBON DIOXIDE, by T. J. Clark and R. C. Giverson. Rept. on Contract AT(45-1)-1350. Dec 60, 21p.

KAPL-M-SLJ-1 $1.60

Knolls Atomic Power Lab., Schenectady, N. J.
THE ALUMINUM ELECTRODE AS AN INDICATOR OF CHLORIDE CONCENTRATION, by S. L. Jones. Rept. on Contract W-31-109-eng-52. 30 Mar 61, 12p.

UCRL-8764 $2.60

Lawrence Radiation Lab., U. of California, Berkeley.
COMPARATIVE CHEMISTRY OF THE LANTHANIDE AND ACTINIDE ELEMENTS, by B. B. Cunningham. Rept. on Contract W-7405-eng-48. 14 May 59, 29p.

TID-12848 $1.60

Massachusetts Inst. of Tech., Cambridge.
EQUILIBRIUM EXTRACTION CHARACTERISTICS OF ALKYL AMINES AND NUCLEAR FUELS METALS IN NITRATE SYSTEMS, by Edward A. Mason and Richard E. Skavdahl. Progress rept. no. 8, 1 Oct 60-31 Mar 61 on Contract W-7405-eng-26. 1 May 61, 17p.

CF-59-3-94(Rev. 2) (deleted) $1.10

Oak Ridge National Lab., Tenn.
EUROCHEMIC ASSISTANCE PROGRAM: COMMENTS BY ICPP, DATED FEBRUARY 25, 1959, ON QUESTIONS LISTED IN ORNL-CF-59-1-75, by M. E. Weech 16 Nov 60, 8p.

TID-7015(Suppl. 3) $7.75

Oak Ridge National Lab., Tenn.
MASTER ANALYTICAL MANUAL, SUPPLEMENT 3. June 61, 650p.

IDO-14552 $0.50

Phillips Petroleum Co., Idaho Falls.
REPROCESSING URANIUM FROM THE FIRST OMRE CORE, by A. L. Ayers and G. J. Raab. Rept. on Contract AT(10-1)-205. 9 June 61, 9p.

TID-12985 $12.00

Pittsburgh U., Pa.
METAL CHELATES OF 4-HYDROXYBENZOTHIAZOLE AND ITS DERIVATIVES, by Pao-Kuo Feng. 1961. 169p.

DP-572 $0.50

Savannah River Lab., Aiken, S. C.
IN-LINE POLAROGRAPHY OF URANIUM IN PROCESS WASTE, by R. C. Propst. Rept. on Contract AT(07-2)-1. June 61, 25p.

Analytical Chemistry

TID-12891 $1.10

Knolls Atomic Power Lab., Schenectady, N. Y.
INSTRUMENTS AND ANALYSIS, by A. C. Titus. 5p.

TID-13224 $1.60

Michigan U., Ann Arbor.
RADIOCHEMICAL SEPARATION OF INDIUM BY AMALGAM EXCHANGE, by R. R. Ruch, J. R. DeVoe, and W. W. Meinke. [1961] 15p.

Physical Chemistry

ANL-6257 $1.50

Argonne National Lab., Ill.
STUDIES OF METAL-WATER REACTIONS AT HIGH TEMPERATURES: 1. THE CONDENSER DISCHARGE EXPERIMENT: PRELIMINARY RESULTS WITH ZIRCONIUM, by L. Baker, Jr., R. L. Warchal and others. Rept. on Contract W-31-109-38. May 61, 62p.

BMI-1533 $1.00

Battelle Memorial Inst., Columbus, Ohio.
XENON DIFFUSION IN SINGLE-CRYSTAL AND SINTERED UO_2, by Russell H. Barnes, Mihkel Kangilaski and others. Rept. on Contract W-7405-eng-92. Aug 61, 41p.

PB 154 975 $7.60

Calvin Coll., Grand Rapids, Mich.
[STUDY OF THE OXIDES OF SILVER]. Technical rept. no. 9 on Contract Nonr-1682(01). 30 Oct 59, 72p. 54 refs. AD-229 265.

DESCRIPTORS: *Zinc compounds, Oxides, *Potassium compounds, Hydroxides, Solutions, Physical properties, *Silver compounds, *Silver electrodes, *Electric potential.

Included in the report are:
Composition and properties of saturated solutions of ZnO in KOH, pub. in the Jnl. of the Electrochemical Society, v. 106, no. 2, Feb 59.
The effect of continuously changing potential on the silver electrode in alkaline solutions, pub. in the Jnl. of Physical Chemistry 63:107-110, 1959.
The silver oxide electrode, pub. in the Jnl. of the Electrochemical Society 106:453-457, May 59.

PB 157 712 $1.60

[Central State Coll., Wilberforce, Ohio].
HIGH TEMPERATURE COMBUSTION METHOD FOR ORGANIC FLUORINE, by B. H. Johnson. Technical rept. on Contract AF 18(600)1573. 2 Mar 60, 16p. 11 refs. AFOSR-TR-60-34; AD-234 427.

DESCRIPTORS: Fluorides, *Fluorine, Organic compounds, Determination, Chemical analysis, Quantitative analysis, Combustion, Decomposition.

An investigation was made of a method for the quantitative microdetermination of F in organic compounds by catalytic dry combustion in an O stream subsequent reaction of the F or fluoride ion with a solid absorbent to form a weighable compound. Attempts to produce a reaction between the F and quartz and determine the F as SiF_4 were unsuccessful owing to the difficulty with which the quartz reacted. Analyses with MgO as the reactant produced erratic results.

PB 157 746 $5.60

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH INVESTIGATION OF PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTOR MATERIALS, by K. E. Bean and R. J. Starks. Final quarterly rept. on Contract DA 36-039-sc-78246. 31 Dec 59, 59p. 2 refs. AD-233 665.

DESCRIPTORS: *Semiconductors, Boron, Production, Preparation, Thin films, Silicon, Single crystals.

Elemental B with no spectrographically detectable impurities was produced by thermal decomposition of synthesized and purified BBr_3 in an atmosphere of H. Chemical analysis indicated the presence of about 0.02% C. Boron was deposited to a diameter of 1/2 in. on electrically heated B filaments about 1/8 in. thick and 5 to 6 in. long. Crystal growth from the melt by the Czochralski technique was accomplished without the use of a crucible. Float zoning was accomplished by moving a molten zone (0.5 to 1.0 cm long) downward over the crystal bar. Zoned bars 1/4 in. in diameter and 8 1/2 in. in length were prepared by this method. The most successful float zoning was accomplished using either (1) boron crystal bars which had been mechanically slipped intact from Ta filament, or (2) boron crystal bars which had been deposited on B filaments. A Czochraiski single crystal was grown by using a single crystal seed. The growth seeded singly and maintained a monocrystalline structure and the same orientation for 0.5 in. of linear growth; the diameter of the growth was 0.3 in. Heat treatment of zone-refined B in gases ambient for several hours at 200°C resulted in marked changes in resistivity. Oxygen and N increased the resistivity; H significantly reduced the resistivity.

UCRL-9723 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
THE HEAT CAPACITY OF SILVER OXIDE AT LOW TEMPERATURES, by Lawrence V. Gregor. Rept. on Contract W-7405-eng-48. May 61, 104p.

UCRL-9469 $1.60

Lawrence Radiation Lab., U. of California, Berkeley.
RESISTANCE MEASUREMENTS TO 400 KILOBARS, by Juozas R. Vaisnys, Harold Stromberg, and George Jura. Rept. on Contract W-7405-eng-48. 8 Nov 60, 12p.

NYO-4688 $1.60

Massachusetts Inst. of Tech., Cambridge.
THE LINEAR ALPHA FUNCTION AND ITS APPLICATION TO BINARY ALLOY SYSTEMS, by Wayne L. Worrell. [1961] 12p.

PB 156 823 $3.60

Massachusetts Inst. of Tech., Cambridge.
THE STRUCTURE OF GASEOUS DETONATION WAVES, by James A. Fay. Rept. on Proj. Squid, Contract Nonr-1858(25). Aug 59, 38p. 60 refs. Technical rept. MIT-23-P; AD-244 923.

DESCRIPTORS: *Detonation waves, Gases, Wave analysis, Shock waves, *Combustion, *Jet propulsion.

This paper was presented at the Eighth International Combustion Symposium 29 Aug-2 Sep 1960 and will appear in the Proceedings of the Symposium.

AD-259 507 repriced $1.00

Naval Ordnance Lab., White Oak, Md.
DIFFERENTIAL THERMOGRAVIMETRY OF THE PYROLYSIS OF EPOXIDE POLYMERS, by Hugh C. Anderson. 16 Jan 61, 32p. 16 refs. NAVWEPS rept. 7335.

DESCRIPTORS: *Epoxides, *Polymers, *Pyrolysis, Decomposition, *Heat resistant polymers, Molecular structure, Chemical bonds, Polymerization, Copolymerization, Benzenes, Phenols, Anhydrides, Amines, Ethylenes, Carboxylic acids, Catalysts, Phenyl radicals, Stability, *Epoxy resins, Plastics, Gravimetric analysis, Temperature, Time.

The pyrolysis characteristics of 15 epoxide polymers have been investigated, using differential thermogravimetry. The results are discussed in relationship to the chemical structures of the polymerizing agents and epoxide monomers used. It is shown that epoxide polymers having different structures decompose at different rates, as indicated by the differential thermogravimetric curves. On the basis of percentage weight loss at 350 C, a diglycidyl ether of bisphenol (D.E.R.) 332/maleic anhydride polymer was most thermally stable. An Epoxide 201/NMA polymer prepared from nadic methyl anhydride and 3,4-epoxy-6-methylcyclohexylmethyl-3,4-epoxy-6-methylcyclohexanecarboxylate was least stable. (Author)

PB 157 823 $9.10

Radio Corp. of America, Camden, N. J.
INVESTIGATIONS OF N-HALOGEN ORGANIC COMPOUNDS FOR USE AS CATHODE MATERIALS IN RESERVE BATTERIES, by L. H. Cutler, C. Eddison and others. Final rept. 1 Nov 56-31 Oct 57 on Contract DA 36-039-sc-73103. [1957] 110p. 2 refs. AD-160 479.

DESCRIPTORS: *Water activated batteries, *Cathodes (Electrolytic cell), Electrodes, Materials, Nitrogen compounds, Organic compounds, Halides, Wet cells, Design, *Halogen compounds, Electrochemistry.

Contents:
Preliminary wet cell studies
Development of a N-halogen reserve cell
Characterization of N-halogen-magnesium reserve cells
New design techniques
Characterization of the unified cathode trichloromelamine-magnesium system
Activation studies
Shelf life studies
Low temperature characteristics

EARTH SCIENCES

AD-255 055 $12.00

Army Electronic Proving Ground, Fort Huachuca, Ariz.
RESEARCH STUDY. SPECIAL CASES OF SIMULATING THE ENERGY BUDGET OF THE EARTH AIR INTERFACE, by J. F. Appleby and Lane Fujikado. Oct 60, 162p. incl. illus. tables, Rept. no. AEPG-SIG 970-30; Micrometeorological research notes no. 1.

This report released by the Coquizant Military Agency for sale to the public 28 Aug 61.

DESCRIPTORS: *Earth, *Atmosphere, Surface area, Meteorology, *Micrometeorology, *Heat transfer, Thermal radiation, Soils, Heat, Analog computers, Water vapor, Convection, Evaporation, Simulation.

A model of the heat budget of the earth/air interface was mechanized on a PACE 31R electronic analog computer. For comparative purposes two test cases were run for each of the seven general observation periods. Case I used constants which assumed the non-unity of the ratio of eddy diffusivities for heat and water vapor while Case II used constants which assumed their ratio to be one. For both cases, changing boundary conditions with time were generated by function generators. The results of the test are presented in a series of graphs which show comparisons of the simulated and observed variables plotted against solar time. Variables compared are the heat fluxes of net radiation, convection, evaporation, and soil heat conduction the air temperature at 160 cm above the ground the soil temperature at 5 cm below the ground surface the air temperature gradient between elevations above the ground of 400 and 50 cm and the wind speed at 160 cm above the ground. Simulated values were generally in good agreement with observed values. Case II more closely approximated observed values than Case I. Biased results were frequently observed in both cases with the direction of the bias tending toward the greater values. (Author)

UCRL-13000 $3.60

Colorado School of Mines Research Foundation, Inc., Golden.
SOURCES OF INFORMATION ON ROCK PHYSICS; CURRENT LITERATURE, MARCH 1961, by Lorraine Burgin. 31 Mar 61, 31p.

Climatology and Meteorology

PB 154 512 $7.60

Quartermaster Research and Engineering Command, Natick, Mass.
CANAL ZONE ANALOGS X. ANALOGS OF CANAL ZONE CLIMATE IN THE PACIFIC ISLANDS, by Jack V. Chambers. Nov 60, 78p. 25 refs. Technical rept. EP-142; AD-252 097.

DESCRIPTORS: *Climate, Climate factors, Panama, Pacific islands, Precipitation, Temperature, Maps.

The temperatures of most of the Pacific area are greatly modified by the warm ocean currents. Only on the mountainous islands do the temperatures vary greatly within short vertical distances from the lowlands to the highlands. The windward slopes of the mountainous islands are the wettest areas to be found in the Pacific area. Relative humidities are high in general because of the nearness of large water areas. Cloudiness is greatest near the heat equator and over the ocean areas. Windspeeds are steady but not excessive in the Pacific area. Complete 4-way analogy with both Canal Zone stations occurs in parts of the Fiji and Society Islands. Parts of the Marshall Islands are analogous to Balboa Heights and parts of the Marquesas Islands are analogous to Cristobal. The Gilbert Islands are too hot, and the Palau Islands are too wet for complete 4-way analogy. Many of the Pacific Islands have insufficient rainfall to be analogous to either Balboa Heights or Cristobal. Of the climatic elements used, the single most limiting element is the mean temperature for the coldest month. The higher slopes of the volcanic islands are too cold in winter to be analogous to either Canal Zone Station. The lee exposure of Honolulu, Hawaii, is the only place analogous outside of the zone north of 20 deg N or south of 20 deg S latitude. (Author)

PB 154 433 $12.50

Quartermaster Research and Engineering Command, Natick, Mass.
MICROCLIMATOLOGY OF A SUBARCTIC SPRUCE FOREST AND A CLEARING AT BIG DELTA, ALASKA, by Fernand de Percin. Apr 60, 176p. 165 refs. Technical rept. EP-130; AD-253 201.

DESCRIPTORS: *Micrometeorology, Precipitation, Trees, Solar energy, Wind, Climatic factors, Alaska.

This analysis deals with the microclimatology of two greatly contrasting sites at Fort Greely, Big Delta, Alaska; one in a coniferous forest (Taiga) and the other in an adjacent clearing. Continuous measurements of the vertical distribution of temperature and wind, and the measurements of solar radiation, precipitation, and globe thermometer temperatures, supplemented by the usual visual and manual observations and measurements, such as sky cover, clouds, snow depth, etc., were conducted from June 1956 through September 1957. An analysis of the data for two months, June 1956 (summer) and December 1956 (winter) is presented. (Author)

ENGINEERING

Aeronautical Engineering

PB 155 952 $8.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF TILTING DUCT AND FAN-WING IN TRANSITION FLIGHT, by Jean F. Duvivier and Robert B. McCallum. Rept. on Contract DA 44-177-tc-486. Dec 60, 98p. 23 refs. Technical rept. 90-1; TREC Technical rept. 61-19; AD-254 847.

DESCRIPTORS: Vertical take-off planes, *Shrouded propellers, *Aerodynamics, Lift, Instrumentation, Wind tunnel models, Drag, Model tests, Thrust, Moments, Pressure, Velocity, Duct inlets.

A study of the ducted fan as a lifting device in forward flight, as a tilting duct and as a wing enclosed fan showed that significant changes in lift and power occur when inlet separation occurs; that sizable crossflow exists in the duct in all cases; that an increase in lift

and power and a decrease in drag occur with forward speed after inlet separation is established which cannot be accounted for by momentum considerations alone. In the case of the fan-wing, the lift curve slope and stability derivative are not changed by the fan operation. A comparison of an articulated and a rigid rotor does not show significant changes in total pitching moments. Comparatively less lifting power is required under similar conditions for the fan-wing than for the tilting duct. Additional force, velocity and pressure data are presented. (Author)

PB 154 319 $3.60

Flight Control Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
JET VANES FOR DIRECTIONAL CONTROL, by A. G. Jones. Rept. on Stability and Control. July 60, 32p. WADD Technical rept. 60-368; AD-245 676.

DESCRIPTORS: *Jet fighters, *Jets, Deflection, *Landing, *Take-off, Runways, *Control systems.

The development is discussed of a vane capable of deflecting the jet exhaust of an aircraft. The purpose of the jet deflection device is to control ground steering of jet fighter aircraft on icy runways. The deflection of the jet exhaust was a satisfactory method of aircraft control. However, the requirement of low-power settings during landing runs made its use as a directional control on the ground only fair. Adding a vane-control system to a manual control system limited the effectiveness of the combination because of high hinge moments. Jet exhaust deflection can best be used where high thrust can be applied, as during vertical take-off or high-altitude flight and where aerodynamic control is low.

PB 157 266 $14.50

Parsons, Ralph M., Co., Pasadena, Calif.
DATA SMOOTHING TECHNIQUES, by Eugen I. Bosch and A. J. Mallinckrodt. Final rept., Phase 1-3 on Contract AF 04(611)648. 1 June 55, 216p. 22 refs. Rept. no. 1026-F1; AD-65 029.

DESCRIPTORS: Data, *Aerodynamic data, Processing, *Aircraft, Sampling, *Statistical analysis, Atmosphere, Turbulence, *Flight testing, Missiles, Instrumentations, Data processing systems.

Contents:
Phase 1. Compilation of data on the spectrum of aircraft trajectory caused by atmospheric turbulence
Phase 2. Sampled data
Phase 3. Numerical filters

PB 156 825 $8.10

Therm Advanced Research, Ithaca, N. Y.
A COMPUTATIONAL PROGRAM AND EXTENDED TABULATION OF LEGENDRE FUNCTIONS OF SECOND KIND AND HALF ORDER, by Marshall M. Sluyter. Rept. on Contract Nonr-2859(00). Aug 60, 89p. 10 refs. Rept. no. TAR-TR-601; AD-247 660.

DESCRIPTORS: *Special functions, Functions, Tables, *Programming, Propeller blades, Velocity, Propeller shrouds.

A tabulation of Legendre functions of second kind and half integral order are presented for orders from 1/2 through 10 1/2, with an accuracy of one unit variation in the fifth digit. The arguments are given for z equal to (1 + yy) with delta y equal to 0.01, and their range extends from 1.0001 to the terminal argument at which the function is equal to or less than 0.00001. Also included is a tabulation for the same range of order and argument where the argument is given for z equal to (1 + y) with delta y equal to 0.1. A general description of the computational program and program flow charts is included. (Author)

PB 156 826 $8.10

Therm Advanced Research, Ithaca, N. Y.
THREE-DIMENSIONAL THEORY OF DUCTED PROPELLERS, by D. E. Ordway, M. M. Sluyter, and B. O. U. Sonnerup. Rept. on Contract Nonr-2859(00). Aug 60, 88p. 26 refs. Rept. no. TAR-TR-602; AD-245 846.

DESCRIPTORS: *Shrouded propellers, Theory, *Aerial propellers, Fluid flow, Fourier analysis.

The ducted propeller with finite blade number at zero angle of attack in a uniform, incompressible, inviscid flow is treated. The approximations of a lightly loaded propeller and of thin airfoil theory are made. In the absence of thickness effects, appropriate vortex distributions represent the blades, the shroud and their respective shed vortices. By means of Fourier analysis of the velocity field in propeller fixed coordinates, the problem for an arbitrary, radial blade circulation distribution is reduced to a form similar to the ring wing integral equations. The kernels are not the same for the two cases except for the zeroth harmonic. The equation for this harmonic, which corresponds to a generalized actuator disk formulation, is identical to that of an equivalent, axisymmetric ring wing. The effect of blade number, blade circulation profile and strength, propeller advance ratio and tip clearance, and location of the propeller plane are found and may be evaluated over a range of parameters from tables provided. (Author)

Chemical Engineering

HW-61594 $1.60

Hanford Atomic Products Operation, Richland, Wash.
COMPARATIVE EVALUATION OF THE AGITATED TROUGH AND FLUIDIZED BED DENITRATION PROCESSES FOR APPLICATION TO THE HANFORD NPF PROGRAM, by B. F. Campbell. 1 June 59, 11p.

NYO-2578 $1.60

Aeroprojects Inc., West Chester, Pa.
ULTRASONIC PROMOTION OF FLOW IN THIXOTROPIC SYSTEMS. Rept. on Contract AT(30-1)-1836. Oct 60, 14p.

PB 157 971 $5.60

Airtron, Inc., Linden, N. J.
THE DESIGN OF BROADBAND FERRITE DEVICES FOR MICROWAVE RELAY APPLICATIONS. Final rept. 15 Feb 57-15 Feb 58, on Contract DA 36-039-sc-73155. [1958] 52p. 21 refs. Rept. no. R11-105; AD-218 077.

DESCRIPTORS: *Microwave relay systems, *Waveguides, *Ferrites, Design, Broadband, Frequency, Electronic equipment.

The successful development is described of ferrite load isolators and ferrite circulators for microwave relay applications in the military frequency bands 7.125 to 8.5 kmc and 13.0 to 15.5 kmc. The theory of operation of the isolators and circulators employed to meet the objectives of this contract are given. Detailed engineering design information is included. A bibliography, conclusions, and recommendations are included. (Author)

PB 154 177 $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE ANOMALOUS-MODE ISOLATOR, by R. W. Crawford. Rept. on Antenna Phenomena Research, Contract DA 36-039-sc-70174. 10 Nov 57, 21p. 7 refs. Rept. 662-14; AD-156 967.

DESCRIPTORS: *Waveguides, *Ferrites, Construction, Electronic equipment, Design, Antennas.

A ferrite isolator may be constructed by placing a full-height slab of ferrite against the narrow wall of rectangular waveguide. Under this condition the TE-type modes are only slightly nonreciprocal. Anomalous modes within the ferrite appear to account for the performance of this isolator. The optimum figure of merit at 24 kmc is 150. This isolator would seem to have inherently higher power-handling capacity than the displacement isolator. The isolator is a narrow-band device. (Author)

PB 154 176 $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
DIGITAL INSTRUMENTATION FOR ANTENNA NEAR-FIELD MEASUREMENTS, by Edward K. Damon. Rept. on Antenna Phenomena Research, Contract DA 36-039-sc-70174. 1 Feb 59, 32p. 2 refs. Rept. 662-22; AD-216 414.

DESCRIPTORS: *Digital computers, Data storage systems, Mathematical computer data, Programming, Antenna radiation patterns, Mathematical analysis, Antennas, Measurement.

A digital recording system, essentially replacing a self-balancing potentiometer-type recorder, is described. Its application to the measurement of near-field parameters on long endfire arrays is discussed, and sample results are shown. Accuracy of the phase measurement is approximately $\pm 20^{\circ}$ for arrays 10,000 electrical degrees long.

PB 154 179 $11.00

Armour Research Foundation, Chicago, Ill.
DESIGN AND DEVELOPMENT LEADING TO A STANDARD WHITE NOISE GENERATOR, by H. Zucker. Final rept. 1 June 56-31 Aug 58, on Contract DA 36-039-sc-72390. 149p. 31 refs. AD-220 306.

DESCRIPTORS: *Noise generators, Design, Temperature, Amplifiers, Noise, Generators.

The design and development of a standard white noise generator for operation in the frequency range 0-1000 mc is presented. The basis of the generator is Nyquist's Law which is reviewed. An alternate derivation of Nyquist's Law was reviewed, specifically the kinetic derivation. The noise power output of the generator as a function of temperature was measured up to 1300°C and found to be linear. The measurement was performed with a specially designed 500 kc amplifier, the design of which is given. Thermal emission effects were analyzed. The noise generator consists of a low reflection termination heated in a coaxial furnace. The basis of the design of the low reflection termination is given together with experimental impedance measurements at room temperature and at the maximum operating temperature of 1300°C. The components of the generator are constructed from graphite and the resistive element consists of a carbon film deposited upon an insulating ceramic base. Several different materials including thoria-base cermets, carbon and metal film resistors were investigated and evaluated for use as the resistive element. The design and performance of the noise indicating equipment is presented. The equipment consists of spot frequency amplifiers in the frequency range 10 to 500 mc, coaxial switch, attenuator and bolometer type power meter.

PB 152 710 $7.60

[Army Signal Research and Development Lab.] Fort Monmouth, N. J.
MODULATION METER ME-57( )/U, by Abraham Grossman. 8 Oct 57, 80p. 1 ref. [Engineering] rept. no. E-1218; AD-156 265.

DESCRIPTORS: *Signal generators, Military requirements, Tests, Design, Broadband, Calibration, Measurement, *Frequency meters, Design, *Frequency modulation, Meters.

Results of the tests on the development models of Modulation Meter ME-57( )/U indicate that, in general, the electrical performance of the equipment is satisfactory for its intended purpose. From a mechanical standpoint, the equipment has proven to be capable of withstanding all tests such as bounce, shock, vibration, etc., and hence is capable of withstanding the rigors of military usage. From a user viewpoint, this equipment eliminates complex test procedures thereby reducing the need for higher grade technical personnel and associated specialized training, and provides for rapid measuring facilities.

PB 157 729 $1.60

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
A NEW TYPE TRANSISTORIZED FREQUENCY MULTIPLIER, by Edgar A. Conover. Oct 57, 15p. 2 refs. [Technical memo.] M-1919; AD-156 255.

DESCRIPTORS: *Frequency multipliers, Design, Transistors, Crystal oscillators, Sidebands.

A frequency mutiplier which utilizes a periodically phase controlled oscillator is described. An amplifier is also provided to increase the amplitude level for synchronizing directly a crystal oscillator at 17 mc. The output level of this amplifier is 1.5 volts RMS across 50 ohms. The suppression of the adjacent lower and upper sidebands is 35 db. Phase jitter is less than 1 millimicrosecond. (Author)

PB 152 712 $1.60

Army Signal [Research and Development] Lab., Fort Monmouth, N. J.
SHOCK TEST MACHINE FOR ELECTRONIC PARTS, by Joseph J. Oliveri. 15 Jan 58, 15p. Technical memo. no. M-1797; AD-159 981.

DESCRIPTORS: *Electronic equipment, *Shock resistance, Test equipment, Vibration, Design

The shock test machine was originally used for testing electrical indicating instruments, but the scope of use has been extended to the testing of relays, capacitors, switches, etc. The machine is widely used, but its characteristics as to pulse shape and reproducibility have been questioned. Spurious vibrations of the test carriage appear to be the principal cause of inconsistency. These vibrations were eliminated by adoption of a new carriage and further design changes to prevent metal-to-metal contact of moving parts. With the improved model, the acceleration pulse is approximately a half sine wave. A four-pound load can be subjected to accelerations up to 110g (110 x 32.2 ft/sec/sec) with approximately 11 milli-seconds pulse duration. Photographs of the original and improved models are shown. Shock pulses obtained with the original model and shock pulses obtained with the improved model are shown. (Author)

PB 157 826 $2.60

Army Signal [Research and Development Lab., Fort Monmouth] N. J.
X-BAND TR TUBE PERFORMANCE AT LOW INCIDENT POWER LEVELS AND UNDER EXTREME AMBIENT TEMPERATURE CONDITIONS, by Edward E. Decamp, Jr., John L. Carter, and Irving Reingold. 24 Jan 58, 29p. [Technical memo.] M-1942; AD-160 162.

DESCRIPTORS: *Transmit-receive tubes, Temperature, *X-Band radiofrequency power, Voltage, Testing equipment.

An investigation was conducted on three basic types of X-band TR tubes to determine their operating characteristics under extremely low incident power conditions and under extreme ambient temperature conditions. Although none of the tubes meet all of their presently specified requirements over the range of power levels used in this investigation, over-all results indicate that the X-band tubes are generally acceptable for operation at peak power levels as low as 10 watts. Operation over an ambient temperature range of -70°C to +150°C indicates that leakage characteristics and recovery time characteristics will not be satisfactory over this complete temperature range.

PB 154 191 $2.60

Bell Telephone Labs., Inc. [Whippany, N. J.]
MICROWAVE SOLID-STATE DEVICES. Interim rept. no. 13, 1 Jan-31 Mar 60, on Contract DA 36-039-sc-73224. 15 May 60, 26p. 5 refs. AD-238 615.

DESCRIPTORS: *Diodes, Crystals, *Semiconductors, Silicon, Amplifiers, Limiters, Design, Circuits.

The results obtained in fabrication of production quantities of both diffused-silicon varactor and PIN protective limiter diodes, are indicated. A brief discussion is given of the designs and processing, together with detailed distributions of electrical characteristics. A feature of both diode types is a low-inductance hermetically-sealed enclosure, geometrically suitable for use with strip transmission line, and well adapted to dissipate heat. Preliminary reliability data are given. Using an S-band power source, the generation of harmonics at X-band with diffused silicon mesa diodes was studied. Input and output powers and calculated efficiencies for a series of diodes, including both steeply and lightly graded diffused-silicon mesa diodes are presented. (Author) (See also PB 149 017)

PB 155 331 $6.60

Bliley Electric Co., Erie, Pa.
DESIGN AND DEVELOPMENT OF HIGH SHOCK AND VIBRATION RESISTANT CRYSTAL UNITS FREQUENCY RANGE 200-500 KC, by J. M. Wolfskill and R. H. Tuznik. Final rept. 1 Jan 57-31 Dec 58, on Contract DA 36-039-sc-73148. [1959] 67p. AD-217 536.

DESCRIPTORS: *Crystal oscillators, Design, Vibration, Shock resistance, Aging, Electronic equipment, Crystals, Processing.

Two types of crystal units were designed, produced, and tested. The units meet all the requirements of MIL-C-3098B for type CR-26/U units. Either type is capable of holding operating tolerances on the order of ±0.0005% of the initial frequency and ±10% of the initial resistance (1) after repeated shocks at 100g of 2 to 6 msec duration and (2) during and after more than 24-hr total duration of vibratory cycling in the 500- to 2000-c range at above 15 g acceleration. The units are capable of withstanding repeated or prolonged testing and are not limited to a single, very short duration performance. A symmetrical H, ceramic-framed mounting arrangement was developed and used with

both crystal units. The mounting has excellent shock and vibration resistance, is relatively simple to fabricate, and does not interfere with the characteristics of the crystal elements to a greater extent than the usual mounting. Although the mounting was specifically developed for CR-26 units in the 200- to 500-kc range, it is readily adaptable to other LF units.

PB 154 973 $5.60

Burgess Battery Co., Freeport, Ill.
VEST BATTERY, by Calvin J. Broughton. Final rept. May 56-Dec 57, on Contract DA 36-039-sc-72407. [1957] 56p. AD-157 359.

DESCRIPTORS: *Dry cells, Design, Human engineering, Heat transfer.

Portions of this report will not reproduce well.

AD-257 736 $9.10

Colorado U., Boulder.
MILLIMETER WAVE TRANSITIONS FOR FREQUENCY CONTROL, by Frank Barnes, Donald Burkhard, and Masataka Mizushima. Quarterly progress rept. no. 3, 11 Oct 60-10 Jan 61, on Contract DA 36-039-sc-85313. [1961] 104p. 3 refs.

This report released by the Coquizant Military Agency for sale to the public 8 Sep 61.

DESCRIPTORS: Microwave frequency, *Microwaves, *Frequency stabilizers, Standards, Molecules, Physical properties, Theory, Electric fields, Magnetic fields, *Molecular rotation, *Molecular beams, Deflection, Signal-to-noise ratio, Perturbation theory, Detectors, Resonance, Design, Mathematical analysis, Alkali metal compounds, Sodium compounds, Hydrides, Hydrogen compounds, Sulfides, Matrix algebra.
The general theory for a diatomic molecule was summarized and the expression was derived for the shift of the energy levels in the presence of a crossed electric and magnetic field. Energy level diagrams for the Stark effect in D_2O are presented. The available data on the Zeeman Effect in H_2S is summarized and additional data on the eigen values for asymmetric top rotators are tabulated. Some effects of the beam geometry and the deflection system on the signal-to-noise ratio of a beam machine are discussed to indicate the importance of various parameters on a figure of merit. (Author)

AD-256 413 $1.60

David Sarnoff Research Center, Princeton, N. J.
MOLECULAR AMPLIFIERS AND GENERATORS, by H. J. Gerritsen. Quarterly rept. no. 2, 1 Dec 60-28 Feb 61, on Contract DA 36-039-sc-87386. 7 Mar 61, 19p.

This report released by the Coquizant Military Agency for sale to the public 8 Sep 61.

DESCRIPTORS: Microwaves, *Microwave amplifiers, Amplifiers, *Radiofrequency generators, Waveguides, Chromium, Titanium compounds, Dioxides, Relaxation time, Lattices, Design, Tantalum, Nickel, Microwave oscillators, Materials, Dielectric properties, Broadband, *Paramagnetic crystals, Ruby, Ions, Atomic spectrum, Paramagnetic resonance, Titanium, Magnetic fields, Measurement.

The usefulness of chromium doped rutile as a maser material was demonstrated in the successful operation of an experimental traveling wave maser consisting only of a waveguide filled with active material. The tunable bandwidth of the maser is from 8 kmc up to 24 kmc. The relaxation time of Ti 3+ in rutile was measured to be only 0.1 msec., but the crystal is lossy. Ni 3+ spectra were studied in rutile. (Author)

PB 154 855 $10.50

David Sarnoff Research Center, Princeton, N. J.
RESEARCH AND DEVELOPMENT ON MICROWAVE GENERATORS, MIXING DEVICES, AND AMPLIFIERS, by W. Knauer and R. C. Knechtli. Final rept. Nov 54-Oct 57, on Contracts DA 36-039-sc-73122 and DA 36-039-sc-64443. 31 Jan 58, 139p. 39 refs. AD-202 892.

DESCRIPTORS: Microwave equipment, Design, *Microwave amplifiers, *Traveling wave tubes, *Electron beams, Microwave frequency, Electron guns, Electron lenses, Noise generators, Reduction, Cooling, Space charges, *Generators.

A system to measure beam noise current and TWT noise figure on the same electron beam has been built. With this system, an experimental verification of the noise theory of TWT was obtained. In addition, the effects of electron lenses, gas pressure, cathode nonuniformities, and higher order modes on beam noise were experimentally observed and theoretically explained. Space-charge wave transforming properties of low noise guns were also measured and accounted for. Scaling laws for low-noise guns were derived. A new approach to noise reduction in TWTs was made by means of an electron cooling device, whereby the electrons, after leaving the cathode, drift through a cool gas and lose part of their thermal kinetic energy in collisions with gas molecules. Consequently their velocity fluctuations become smaller and their noise content is reduced. The properties of such a cooling device have been investigated in an experimental system. Results obtained so far, show promising temperature reductions in electron beams of satisfactory current densities.

PB 152 080 $9.60

Denver Research Inst., Colo.
INVESTIGATION OF TECHNIQUES FOR IMPROVING RADIO FREQUENCY SPECTRUM CONSERVATION AND UTILIZATION IN MILITARY TELEVISION APPLICATION, by Howard L. Roberts. Final rept. 15 June 54-15 Apr 58, on Contract DA 36-039-sc-63183. [1958] 113p. 36 refs. AD-202 730.

DESCRIPTORS: *Television communication systems, *Military communications, Information theory, Communication systems, Radiofrequency.

The pulse-code television system was adapted to a complete mobile transmission system. The field tests conducted with the system indicated that pulse-code television offered no improvement in transmission reliability, since an air channel signal-to-noise ratio which is lower than the threshold of the pulse-code noise-cleaning action is yet sufficiently high to obtain good reception by conventional amplitude modulation. However, since some form of coding will ultimately be required to obtain bandwidth compression, and also since there is an increasing interest in means of coding television signals to obtain secure transmissions, further work was continued on improving the performance of the pulse-code modulated or "quantized" television system. One method (Z-axis interlace) for obtaining ten gray levels while transmitting only two binary pulses per picture element was developed. A method of transmitting two channels of information on two RF signals which occupied the same channel in the RF spectrum by cross-circular polarization of the radiated electromagnetic waves was also explored. Other means of improving pulse-code performance without increasing the necessary bandwidth are also discussed. (Author)

PB 157 747 $9.10

Eagle-Picher [Research Labs.] Joplin, Mo.
SERVICES, FACILITIES AND MATERIALS LEADING TOWARD DEVELOPMENT OF RESERVE AND NON-RESERVE HIGH RATE BATTERIES FOR BOTH "A" AND "B" POWER, Final rept. on Contract DA 36-039-sc-64545. 30 Nov 57, 103p. AD-157 363.

DESCRIPTORS: *Wet cells, Design, Materials, Military requirements, Physical properties, Electrical properties, Stability, Tests, Battery separators, Heat treatment, *Storage batteries, Silver compounds, Oxides, Zinc.

The studies have brought about a very real improvement in the silver oxide-zinc battery system. Fundamental studies have been carried out which have shown new capabilities as well as some limitations of the system. An automatically activated battery has been designed which is capable of meeting a wide range of military applications. This battery has been adapted to the use of both chemical and electrical heat for operation under conditions of low ambient temperatures.

PB 154 175 $4.60

Eagle-Picher [Research Labs.] Joplin, Mo.
WATER ACTIVATED BATTERIES. Final rept. on Contract DA 36-039-sc-72374. 30 June 57, 41p. AD-142 542.

DESCRIPTORS: *Water activated batteries, Design, Materials, *Copper compounds, *Chlorides, Tests.

The development of a cuprous chloride plate with a density approaching that of the silver chloride positive plate has been carried out with reasonable success. The material which was developed is actually about twice the density of the pasted type positive material. It is much easier to handle in that it is a flexible and non-flaking sheet. For best results, especially at high rates or cold temperatures, it requires a grid, but application of the grid requires only a simple pressing or rolling operation. The high density plate material, as it exists at this time, appears to have greatest possibilities in the field of submerged applications. It is felt that further developments may broaden its fields, however, and a transition to material of this general type is almost sure to occur as the cuprous chloride magnesium battery uses expand. (Author)

PB 157 734 $17.00

Electron Physics Lab., U. of Michigan, Ann Arbor.
MODULATION CHARACTERISTICS OF O-TYPE ELECTRON-STREAM DEVICES, by Harold Sobol. Doctoral thesis. Technical rept. no. 33 on Contract AF 30(602)1845. Oct 59, 264p. 53 refs. Rept. no. 2750-13-T; RADC-TR-59-187; AD-230 079.

DESCRIPTORS: *Modulation, *Traveling wave tubes, *Amplifiers, Amplitude modulation, *Electron beams, Microwave amplifiers, Low frequency, High frequency, Electromagnetic waves, Space charges.

A general study is presented of the modulated O-type electron-stream device. The modulations are classified according to the frequency of the modulating signal. Low modulation frequencies are very much less than the carrier frequency, while high modulation frequencies are comparable in rate to the carrier frequency. In order to simplify the analysis, the low- and high-frequency cases are investigated separately. The O-type device undergoing a low-frequency beam modulation is described by a set of quasi-static functions. These functions are found by standard linear methods when the carrier is a low-level signal. The analysis includes modulation effects on C, QC, b, and d, as well as the initial wave amplitudes, and is valid for large modulation amplitudes. The device with a large-signal carrier is investigated using the nonlinear Lagrangian formulation. The modulation characteristics are used to calculate the output spectra when modulating signals having specific wave shapes are applied. (Author)

PB 157 725 $5.60

Electron Physics Lab., U. of Michigan, Ann Arbor.
THEORETICAL POWER OUTPUT AND BANDWIDTH OF TRAVELING-WAVE AMPLIFIERS, by Harold Sobol and Joseph E. Rowe. Technical rept. no. 32 on Contract AF 30(602)1845. Aug 59, 57p. Rept. no. 2750-11-T; RADC-TR-59-153; AD-230 159.

DESCRIPTORS: *Traveling wave tubes, *Amplifiers, Waveguides, Circuits, Theory, Mathematical analysis, Power, Frequency

Expressions are developed to calculate the theoretical power output of traveling-wave amplifiers using any type of r-f structure. Calculations are made for helix-type tubes and it is shown how to calculate the power

output of tubes using more dispersive structures in terms of calculations made for helix tubes. The principle factors accounting for higher power output of dispersive structure are presented and discussed. The gain and bandwidth of forward-wave helix amplifiers are derived from the small-signal theory as functions of frequency and it is shown that the gain in db times the frequency bandwidth is a constant as a function of helix length for high $\gamma_0 a'$ and the gain times the bandwidth squared is a constant for low $\gamma_0 a'$. (Author)

PB 152 594 $6.60

General Communication Co., Boston, Mass.
DEVELOPMENT OF TRANSPONDER SET AN/DPN-4(XE-1), by Roger G. Long and Leo E. Macdonald, Jr. Final engineering rept. 14 June 55-10 June 58, on Design and Production of Transponder Set for Tracking Rocket-Propelled Missiles and Other Pilotless Aircraft, Contract DA 36-039-sc-64731. [1958] 66p. 13 refs. AD-208 654.

DESCRIPTORS: *Radar beacons, Design, Production, Pilotless aircraft, Guided missiles, Guided missile tracking systems, Radar tracking, S band, Tracking, Rocket propulsion.

A brief description of the over-all development program together with a resume of conferences, reports and publications related to the contract is presented. A more complete description of the theory of operation of the final circuit is given in the Instruction Book for Transponder Set AN/DPN-41(XE-1). In order to attain high-performance characteristics in this miniature unit, special techniques and components were developed. Typical of these are the use of etched foil component board assemblies, encapsulated assemblies, the miniature three-cavity preselector, the delay line and the pencil-triode transmitter cavity. Some of the difficulties encountered were the unreliability of the early transmitter cavities, erratic operation of the vibrator power supply and the modifications required to the power connectors. A total of 25 models of the transponder set were constructed and delivered on the subject contract. A resume of the test data is included.

PB 155 563 $17.00

[General Dynamics/Electronics] Rochester, N. Y.
BAUD-SYNCHRONOUS RADIO-TELETYPEWRITER TERMINAL EQUIPMENT, by C. G. Hewitt. Final rept. 14 May 56-29 Nov 58, on Contract DA 36-039-sc-72347. May 59, 265p. 9 refs. AD-227 783.

DESCRIPTORS: *Radio teletype systems, Radio communication systems, Teletype equipment, Tests, Detection, Design, Automatic

The performance of the Baud-Synchronous Radio-Teletypewriter System has demonstrated the feasibility of the system. Test results show that the system offers a 6- to 13-decibel improvement over standard frequency-shift-keyed operation. The improvement depends on the type of noise (gaussian or impulse) and the fading conditions. The system is compatible with existing radio-teletypewriter networks. The system generates a radio-teletypewriter frequency-shift signal that can be received by conventional frequency-shift equipment error rates normally associated with the receiving equipment employed. The signal has specific properties which permit correlation detection at a receiver equipped with the Baud-Synchronous Receiver-Converter Unit. The Baud-Synchronous Receiver Unit is designed for two modes of operation; the envelope-detection mode, and the phase-coherent or product-detection mode. The Baud-Synchronous Receiver is synchronized by a double integration or sampling of each character stop baud. The operation is automatic, but manual synchronization facilities are available for quickly achieving partial initial synchronism. (Author)

PB 154 497 $10.50

General Electric Co., Auburn, N. Y.
FERRITE MATERIALS FOR MICROWAVE FREQUENCIES, by H. C. Rothenberg, J. B. Linker, and N. Schwartz. Final rept. 15 June 55-15 Sep 57, on Contract DA 36-039-sc-64696. [1957] 131p. 6 refs. AD-208 070.

DESCRIPTORS: *Ferrites, Microwave equipment, Materials, *Microwave frequency, S band, Design, Measurement, Resonance.

An extensive study of materials intended for S-band applications, has resulted in the development of two compositions with highly desirable properties. Both magnesium ferrite aluminates, have been prepared with narrow line widths, suitable for low power applications, and broad line widths for high power applications. Intrinsic line widths for these materials at 3000 megacycles, are 80 to 90 oersteds. Studies have also been made of nickel ferrite aluminates for high power purposes. Certain features of their resonance line shapes make them attractive for special microwave applications. The effects of additives and processing techniques have been investigated in the magnesium ferrite aluminate and nickel ferrite aluminate groups. Results indicate that the effect of many additives on sintering is similar, but significantly different in controlling resistivity and linewidth. Application of the Kronig-Kramers relationship to some experimental results shows that it can be used to extract phase information from the resonance line, or vice versa. A tabulation of the most pertinent properties of three of the best materials studied is given. A S-band measurement system was designed and used for the evaluation of large numbers of ferrite samples. (Author)

PB 153 049 $8.10

General Tire and Rubber Co., Marion, Ind.
CONSTRUCTION OF LIGHT WEIGHT PLASTIC PARABOLIC RADAR REFLECTORS, by J. R. Cowdin. Final rept. 20 May 57-20 July 58 [on Contract DA 36-039-sc-73268]. [1958] 84p. AD-212 027.

DESCRIPTORS: *Radar reflectors, Design, *Parabolic antennas, Sandwich construction, *Plastics, Laminated glass, Glass textiles, Reflectors.

Portions of this report will not reproduce well.

PB 152 593 $19.75

Glenco Corp., Metuchen, N. J.
FIXED CERAMIC CAPACITOR TEMPERATURE COMPENSATING AND HIGH-K, by Harold Keitelman. Final rept. 15 May 56-15 Aug 57, on Contract DA 36-039-sc-72323. [1957] 302p. AD-157 587.

DESCRIPTORS: *Ceramic capacitors, *Fixed capacitors, Voltage, Temperature, Life expectancy, Statistical tests, Tests, Failure (Mechanics).

Contents:
Phase 1. Preliminary tests and accelerated failures
Phase 2. Large scale pre-testing and life tests
Phase 3. Life tests with varied conditions
Phase 4. Analysis of test results and application to final samples

PB 157 827 $9.60

Goodrich, B. F., Co., Brecksville, Ohio.
NEW POLYMERIC INSULATING MATERIALS, by C. S. Schollenberger, C. R. McCulloch and others. Final rept. 1 Aug-31 Oct 57, on Contract DA 36-039-sc-64534. 1 Nov 57, 112p. 5 refs. AD-160 027.

DESCRIPTORS: *Electric wire, Field wire, *Urethanes Polymers, Electrical properties, Design, Plastics, *Insulating materials, Electric insulation, Oxygen, Absorption.

The weather resistance of Polyurethane VC, Polyurethane VC(Weather resistant variety) and their compounds with carbon blacks, antioxidants, and commercial ultraviolet absorbers has been further studied. The synthesis and evaluation (Weatherometer) in Polyurethane VC of compounds absorbing strongly in the 340 to 410 mμ range of the electromagnetic spectrum has provided stocks showing outstanding weather resistance. A quantitative study of the oxygen absorption on Weatherometer exposure of Polyurethane VC and its highly stable black compound, as well as the less stable Uvinul 490 compound, show all three to absorb appreciable oxygen. The exposure of a model compound for Polyurethane VC to the combined action of oxygen and ultraviolet radiation (GE Sunlamp) did not result in detectable changes in the material. Attempts to prepare harder, inherently weather resistant polyurethane jacketing materials have met with some success. The chemical stabilization of Polyurethane VC by N-alkylation (grafting with isobutylene and with acrylonitrile), and by incorporating the piperazine residue as the urethane bridge in the polymer chain, is under study. The estimation of the abrasion resistance of candidate jacketing materials and their hardened stabilized compounds on a laboratory abrader using knife edge, round, and octagonal blades has provided further information on the requirements for suitable jacketing compositions, and has allowed a provisional relationship between performance in this tester and set and Pico abrasion properties to be set up.

PB 155 561 $1.60

Hughes Aircraft Co., Culver City, Calif.
SOLID-STATE MASER AMPLIFIER, X-BAND, by T. H. Maiman. Final rept. 1 Dec 57-31 Nov 58, on Contract DA 36-039-sc-74951. [1958] 17p. 2 refs. AD-226 515.

DESCRIPTORS: *Microwave amplifiers, *Paramagnetic crystals, Growth, X-Band, *Magnets, *Miniature electronic equipment, *Preamplifiers, Design, Ruby, Microwave oscillators.

The design and performance of a complete X-band maser receiver are described. Novel design features include a ruby-filled cavity which is fabricated from a solid block of ruby and coated with silver. An internal 12-ounce permanent magnet provides the required magnetic field. Achievement of substantial miniaturization in maser design is reflected in the over-all weight and size, which are 25 pounds and 1/3 cubic foot, respectively. This maser was successfully operated at temperatures from 1° to 100°K. At 4.2°K, the gain-bandwidth product is 105 mc and the over-all receiver noise temperature is 25°K. (Author)

PB 154 833 $2.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
X-BAND LADDER-LINE TRAVELING-WAVE MASER, by G I. Haddad and J. E. Rowe. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. Feb 61, 27p. 10 refs. 2900-239-T; EPL technical rept. 42; AD-251 136.

DESCRIPTORS: *Microwave amplifiers, X-band, Polarization, Waveguides, Magnetic fields, *Microwaves, Phase shifters, Tests, Ruby, Crystals.

The factors to be considered in the design of a broadband traveling-wave solid-state maser are outlined, with particular consideration given to the choice of an rf propagating structure. Desirable structure characteristics for a TWM (traveling-wave maser) are low loss, high slowing, ease of coupling between the pump signal and the paramagnetic crystal, simple, rugged construction, and easily accessible regions of different senses of circular polarization of the rf magnetic field. An X-band ruby TWM has been constructed and tested in which the rf structure is a double-ridge ladder line and the signal is coupled into and out of the structure with coaxial lines. The pump power is propagated in a waveguide mode and the device is operated at and below liquid-helium temperatures. A 4-inch electromagnet was used. The TWM was operated at the push-pull point with a pump frequency of 24 kmc and a signal frequency of approximately 9.65 kmc; the magnetic field was 4.1 kilogauss. Gross gains of 15 db have been obtained and bandwidths as high as 130 mc were observed. (Author)

PB 157 745 $9.10

ITT [Federal] Labs., Nutley, N. J.
HIGH POWER PULSE CABLE TERMINATIONS, by W. C. Murray and J. H. Gesell. Final technical rept. 1 May 56-1 May 57, on Contract DA 36-039-sc-71210. Aug 58, 104p. 2 refs. AD-204 618.

DESCRIPTORS: Design, *Pulse cables, Radiofrequency cables, Dielectrics, *Electric connectors, Terminal blocks, Materials, Design, Test equipment, Electrical corona, Ceramic materials, Insulating materials, Electric insulation, Butyl rubber.

Triaxial high-power pulse cable terminations consisting of a cable plug and an equipment receptacle have been developed for use with type 1215 and type 2515 butyl-rubber-insulated pulse cables. The terminations as developed satisfactorily meet all target requirements and pass all required tests with the possible exception of corona extinction level. The basic termination design is sound. It is a flexible design that will allow the incorporation of all presently indicated improvements. The feasibility of eliminating dielectric fluids by using a soft butyl bushing under compression, to avoid voids between a large diameter butyl cable dielectric and a hollow ceramic insulator, has been shown. A low durometer nonconductive butyl and a butyl-to-butyl bonding cement have been satisfactorily developed for this application.

PB 152 666 $3.60

Kleinschmidt Labs., Inc., Deerfield, Ill.
REPERFORATOR-TELETYPEWRITER TT-195( )/FG, by D. F. Frick. Final engineering rept. 21 June 56-28 July 58, on High-Speed Electronically Controlled Typing Reperforator, Development of, Contract DA 36-039-sc-73059. [1958] 32p. AD-211 644.

DESCRIPTORS: *Teletype systems, *Teletype equipment, Design, Model tests, Electronic circuits, *Printing.

Design and tests of experimental punching and printing mechanisms (Phase 1), construction of a working model and associated electronic circuitry (Phase 2), final design and fabrication of two complete models for delivery (Phase 3). Results of tests conducted on final models indicate that high-speed mechanical printing and punching are entirely practical. (Author)

PB 152 511 $4.60

Little, Arthur D., Inc. [Cambridge, Mass.]
RESEARCH INVESTIGATION OF REFLECTIVE WALL COATINGS FOR MICROWAVE RESONATORS. Final rept. 15 Jan 57-15 Dec 58, on Contract DA 36-039-sc-73143. 15 Dec 58, 42p. 19 refs. Rept. no. C-60628; AD-215 399.

DESCRIPTORS: Radar echo boxes, *Cavity resonators, Spin, Relaxation time, *Microwave oscillators, Design, Measurement, Radar reflectors, Atoms, Rare gases, Surfaces, Photographic analysis, Mathematical analysis

A new method for studying the spin relaxation of optically aligned rubidium vapor has been developed. In this method, pumping radiation consisting of the circularly polarized 7940 Å D_1-line of rubidium, is suddenly shut off completely by means of a mechanical shutter, and is then turned on again after a measured time interval. The increase in opacity of the vapor, at the instant that the light beam is turned on again, is a direct measure of the spin relaxation during the interval of darkness. By employing a series of shutter intervals, the spin relaxation time can be measured directly. This procedure has been applied to a measurement of the relaxation time of rubidium diffusing through neon, argon, krypton and xenon contained in an unlined cylindrical glass vessel over a wide range of pressures. Analysis of the data for unlined cells indicates that complete spin disorientation does take place on uncoated glass. (See also PB 147 178)

AD-256 716 $2.60

Melabs, Inc., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS, by Roy W. Roberts. Quarterly progress rept. no. 2, 8 Mar-3 Apr 61 on Contract DA 36-039-sc-87412. 18 Apr 61, 23p.

This report released by the Coquizant Military Agency for sale to the public 8 Sep 61.

DESCRIPTORS: *Ferromagnetic materials, *Ferrites, *Frequency multipliers, *Garnet, *Microwave amplifiers, Microwaves, Non-linear systems, Single crystals, Crystals, Electronic equipment, Microwave equipment, Theory, Electromagnetic properties, Nickel compounds, Zinc compounds, Tests, Yttrium compounds.

The non-linear effects in the microwave properties of ferrites and ferrimagnetic-garnet materials are being studied. Two millimeter wave generation experiments using nickel-zinc ferrite and Ferroxplana type hexagonal signal crystals are described. The hexagonal material did not give a high conversion efficiency. An analysis of a longitudinally pumped ferrite amplifier is given. Expressions for gain, bandwidth, gain-bandwidth product and noise temperature are derived. Experimental observations of a relaxation type oscillation are given. (Author)

PB 153 868 $7.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ANALYSIS OF A SURFACE WAVE TRANSMISSION LINE, by L. Birenbaum and J. W. E. Griemsamann. Rept. on Contracts DA 36-039-sc-73219 and DA 36-039-sc-78001. 14 Nov 58, 78p. 12 refs. Research rept. R-666-58; PIB-594; AD-214 041.

DESCRIPTORS: *Transmission lines, *Waveguides, Electrical properties, Design, *Wave transmission, Dielectrics, Mathematical analysis, Electric fields, Attenuation, Wire, Brass, Coatings.

An analysis is presented of a wave guide consisting of a metal wire enclosed within a concentric dielectric tube, but separated from it by an air space. Although the surface guide is capable of supporting E, H and hybrid wave types, the work is concerned mainly with the lowest E mode. Data are given pertaining to the fields, attenuation, field spread and guide wavelength. Graphs are included from which may be determined the cutoff frequencies of higher symmetrical (E and H) modes. These electrical properties are then extensively compared with those of the dielectric-coated wire, or Goubau wire, to which it is very closely related.

PB 157 728 $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
BROADBAND, RUGGED CALORIMETER POWERMETERS, by Paul Mariotti. Final rept. on Contract DA 36-039-sc-64579. 20 Sep 57, 49p. 8 refs. Rept. R-608-57; PIB-536; AD-155 026.

DESCRIPTORS: *Power meters, *Calorimeters, *Radiofrequency power, Design, Measurement, *Waveguides, Broadband, Waveguides.

Calorimetric powermeters were designed and constructed in the 3 waveguide sizes RG 96/U, RG 97/U, and RG 98/U. The units consist basically of 2 thin-walled waveguides of identical construction arranged in a thermal Y to achieve thermal balance. Conduction effects are minimized by use of thermal insulators. Power absorbed by the load in the active calorimeter causes its temperature to rise with respect to the dummy waveguide and the difference in temperature is registered by a thermopile mounted on both thin-walled waveguides. Since many thermofunctions are used, and these are distributed over the length of the waveguide, an integrated effect is obtained. The thermopile output can then be connected to a galvanometer or to an indicating dc amplifier of low inherent noise, and the calorimeter can be calibrated by use of dc power. With good load and casing design the RF dc substitution error can be made negligibly small (less than 0.3%). A power box was designed for the purpose of applying accurately known dc power to active or dummy loads, each of which is provided with separate terminals for LF power substitution. Instrumentation was also developed such that a power indication could be obtained in a fraction of a minute. This instrumentation makes possible the application of RF power for a short interval of time (about 20 sec) during which the temperature build-up of the calorimeter is in the transient state.

PB 157 736 $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
SYNTHESIS TECHNIQUES FOR GAIN-BANDWIDTH OPTIMIZATION IN PASSIVE TRANSDUCERS, by H. J. Carlin. Rept. on Contract AF 18(600)1505. 20 Oct 59, 39p. 7 refs. Research rept. R-775-59; PIB-703; AFOSR-TN-60-27; AD-233 001.

DESCRIPTORS: Synthesis, Design, *Transmission lines, Transducers.

This paper is concerned with an approximating technique for realizing the design of broadband equalizers and matching networks which approach optimum gain bandwidth performance. Given an arbitrary load impedance it is possible, by methods of Bode, Fano, LaRosa - Carlin, to derive the limiting constraints for optimum flat power or voltage transfer over a prescribed band. The synthesis of equalizer networks to approximate this optimum response is a difficult matter, particularly when the load has some degree of complexity. This is because methods proposed up till now prescribe an approximating transfer function which includes the load characteristics, and the problem of adjusting the parameters of such an approximating function is quite formidable. The technique proposed here bypasses this problem by producing from the idealized gain bandwidth constraints a set of functions which specifies the equalizer alone. All load dependence is removed from the specifications as an initial step in the synthesis. The final transducer is then synthesized from the approximating functions which are obtained. Examples of one-port and two-port equalizer network designs utilizing this technique were given. (Author)

PB 152 508 $9.10

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
HIGH-FREQUENCY TRANSISTOR EQUIVALENT CIRCUITS, by H. E. Tompkins and C. N. Weygandt. Final rept. 1 July 56-30 June 58, on Contract DA 36-039-sc-73046. 15 July 58, 104p. 6 refs. Moore School rept. no. 58-26; AD-211 184.

DESCRIPTORS: *Transistors, *Circuits, High frequency, Amplifiers, Oscillators, Digital computers, Power, Impedance.

Contents:
Driving-point and transfer measurements using the Rohde-Schwarz diagraph
Practices and techniques of medium-frequency measurement
Use of a digital computer for network verification
Calculation and measurement of power gain
Characterization of a western electric type GA 53194 transistor
Evaluation of an experimental 30 MC transistor
Summary of the driving-point admittance method

AD-257 582 $3.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
POWER DENSITY MEASUREMENT TECHNIQUES, by Ernest Jacobs, Nabil Farhat, and Robert A. Leavenworth. Progress rept. no. 2, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85177. 30 Apr 61, 34p. 11 refs. Moore School rept. no. 61-16.

This report released by the Coquizant Military Agency for sale to the public 8 Sep 61.

DESCRIPTORS: *Radiofrequency power, Test methods, Crystal rectifiers, Hall effect, Design, Transducers, Antennas, Microwaves, Radiation hazards, Radio waves, Crystal detectors, Electromagnetic fields, *Power meters, Measurement.

Research was continued on methods of measuring power density primarily from the viewpoint of obtaining hazard information. The block diagram of the functional procedures needed to measure power density was developed. The specific power density measuring system using an antenna to sample the field and a crystal detector to convert the RF signal to a measurable quantity is considered. The relationship between power density and meter indication of this system is the product of 2 factors that are relatively independent of each other. These factors are called front-end and back-end transformation ratios. It was decided to obtain the back-end ratio experimentally. (Author)

PB 155 015 $6.60

Olin Mathieson Chemical Corp., New Haven, Conn.
INVESTIGATION ON MEANS OF HEATING AND INSULATING BATTERIES, by Richard C. Evans, Murray A. Heine and Nicholas Amodio. Final rept. 15 Apr 56-15 Apr 57, Contract DA 36-039-sc-71212. 15 May 57, 67p. 9 refs. AD-137 912.

DESCRIPTORS: *Low temperature batteries, Design, Ignition, *Heat exchangers, Containers, *Insulating materials, Electric insulation.

The purpose of this contract was to develop a battery composed of magnesium LeClanche cells and a pyrotechnical source of heat so arranged that the battery will operate upon ignition at ambient temperatures as low as -65°F and exhibit a capacity approaching that obtainable when the ambient temperature is 70°F.

AD-258 261 $2.60

Philco Corp., Lansdale, Pa.
RESEARCH AND DEVELOPMENT OF A 1000 MC GERMANIUM AMPLIFIER TRANSISTOR, by Robert L. Luce and James Biscoe. Quarterly rept. no. 3, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85367. [1961] 30p. Philco no. R 111.1.

This report released by the Coquizant Military Agency for sale to the public 8 Sep 61.

DESCRIPTORS: *Transistors, *Transistor amplifiers, Germanium, Ultra high frequency, Amplifiers, Design, Tests, Life expectancy, Electronic circuits, Specifications.

Investigation has led to the fabrication of devices capable of 15.2 db of power gain at 1000 mc. Typical units fabricated previously had about 12 db gain at 100 mc. A study of the relationship between rb'Cc and power gain revealed the possibility of increasing the power gain (un-neutralized) by changing the internal amplification factor of this device. The device is electrically stable, as shown by the life test results. (Author)

PB 157 739 $14.00

Philco Corp., Philadelphia, Pa.
SHF ANGULAR DIVERSITY STUDY PROGRAM. Final rept. on Contract AF 30(602)1985. 30 Nov 59, 207p. 6 refs. RADC-TR-60-30; AD-234 425.

DESCRIPTORS: Super high frequency, *Communication systems, *Diversity reception, *Atmosphere, Antenna radiation patterns, Antennas, *Signals, Scattering.

Angular diversity measurements at 7630 Mcps over a 247 effective - mile tropospheric path show that diversity improvements comparable to theoretical ones are available; that elevation squint is superior to azimuth squint for the system tested; and that essentially uncorrelated signals are received by a paraboloidal antenna with twin feedhorns whose beam separation is one beamwidth. In addition, information is presented as to fading rates, range of received hourly median signal levels, and the median for the test period of scatter loss plus aperature-to-medium coupling loss.

PB 154 856 $4.60

Philips Labs., Irvington-on-Hudson, N. Y.
CERAMIC PERMANENT MAGNET MATERIALS FOR MICROWAVE APPLICATIONS, by F. K. du Prè, D. J. De Bitetto and others. Final rept. 1 May 57-30 Apr 58, on Contract DA 36-039-sc-73223. [1958] 41p. 6 refs. Technical rept. no. 128; Case no. 13-126; AD-161 873.

DESCRIPTORS: *Magnetic materials, Magnetic properties, Ceramic materials, Microwaves, Single crystals, Measurement, Oxides, Barium compounds, Aluminum compounds, Strontium compounds.

Microwave measurements were made at M-band frequencies (50-75 kmc/sec). An improved device was completed which enabled more accurate measurements of the "reverse to forward" ratio for the materials studied. Results show that these materials are sufficiently loss-free to be promising for certain applications. In the series $1.1SrO \cdot xAl_2O_3 \cdot (6-x)Fe_2O_3$, the previously reported increase in the natural ferromagnetic resonant frequency with x was verified. To date the cases x = 0, 0.1, 0.2 and 0.5 of this series have been investigated, where the 0.2 case is described in detail. The overall conclusion is that in the series, $BaO \cdot xAl_2O_3 \cdot (6-x)Fe_2O_3$ and $SrO \cdot xAl_2O_3 \cdot (6-x)Fe_2O_3$, the anisotropy field can be varied from about 17,000 oersteds to about 30,000 oersteds by a suitable choice of x between 0 and 1. The materials were found to be suitable for the construction of broad band microwave resonance isolators in the M and E bands. (Author)

PB 155 733 $8.60

Radiation Research Corp., New York.
FILM DIELECTRIC CAPACITORS, by John H. Coleman. Final rept. 1 July 58-30 June 60, on Contract DA 36-039-sc-73203. [1960] 97p. AD-243 443.

DESCRIPTORS: *Capacitors, *Dielectric films, Design, *Subminiature electrical equipment, Guided missiles, Polymerization, Metal films, Plastics.

Thirteen capacitors assembled during the previous period using leads attached by conducting cement to the one micron Teflon film were tested during this period. Only one failure was observed for the time of the test (1000 to 3000 hours); however, raising the temperature to 125°C caused failure of most units. A continuous polymerizer was designed and fabricated. After modifications film was produced and capacitors assembled. Initial tests indicated low IR; however, further tests showed this occurred for film thickness below one micron whereas values exceeding 2000 megohm-MFD could be obtained using about 1.5 microns. Some developmental models were metallized and assembled by hand. Tests indicated satisfactory results on some models when cleared prior to winding. Approximately 1000 feet of film were polymerized and metallized. After testing the film was wound into 50 capacitors by a subcontractor. Tests indicated the IR was low as expected prior to clearing, but could not be cleared to values reached by our hand assembled units. Future film will be produced with exposed metal edges to facilitate clearing before winding. (Author) (See also AD-233 838)

PB 152 708 $1.60

Radio Frequency Labs., Inc., Boonton, N. J.
CRYSTAL IMPEDANCE METER TS-300/TSM (IMPROVED TYPE), by E. A. Gilbert. Final engineering rept. and addendum on Contract DA 36-039-sc-72316. 8 July 58, 20p. AD-216 202.

DESCRIPTORS: *Test sets, *Meters, *Impedance, Radiofrequency, *Quartz capacitors, Crystals, Electrostatic capacitance

The development problems centered around the load capacitor, the load capacitor shield box, and the crystal test socket. These components were redesigned and two models constructed. After submission to tests, deficiencies were located and corrected. (Author)

PB 157 721 $19.75

Raytheon Co., Newton, Mass.
INDUSTRIAL PREPAREDNESS STUDY OF TRANSISTORS AND AUTOMATIC MACHINERY FOR THEIR MANUFACTURE, by Frank M. Dukat and Joseph M. Welty. Final rept. 28 Mar 55-1 July 59, on Contract DA 36-039-sc-66038. [1959] 302p. AD-230 693.

DESCRIPTORS: *Transistors, *Industrial production, Automatic, *Machines, Preparation, *Germanium, Manufacturing methods, Industrial mobilization, Industrial equipment, Specifications, Military requirements, Automation

A production design for an alloy junction, PNP, germanium transistor (QC-117) was developed which was suitable for high speed switching applications. Acceptable production yields were demonstrated by the large scale pilot run. The transistor design was altered considerably from the original drilled-hole-in-chip conception. The change to the use of ring base tabs helped to lower the extrinsic base resistance as well as to provide backing strength for the thin chip. Changes in the chip thickness, chip resistivity, emitter and collector sizes helped to reach the desired electrical characteristics. Long term stability as well as the ability to withstand various environmental conditions, was considerably improved by the change from a soldered to a welded package and by the use of $CaSO_4$ desiccant and silicone oil as a can filling material. Specifications and flow charts of costs are presented.

PB 150 907 $9.60

RCA Service Co., Camden, N. J.
AIR FORCE GROUND ELECTRONIC EQUIPMENT RELIABILITY MEASUREMENT, USING FORM DD 787-1, by R. A. Miles. Final engineering rept. on Contract AF 30(602)1623. 15 Aug 59, 120p. 6 refs. Rept. no. R-2-59; RADC-TR-59-154; AD-227 614.

DESCRIPTORS: *Electronic equipment, Reliability, Military equipment, Data processing systems, Air force equipment, Measurement

This report describes procedures and techniques used to measure reliability of ground electronic equipment in the field from Department of Defense Form DD 787-1. Reliability estimates of the five equipments studied were as follows: (1) AN/FPS-3 - 95 hours, (2) AN/FPS-20 - 75 hours, (3) AN/GPX-20 - 738 hours, (4) AN/GRC-27 - 1172 hours, and (5) AN/GRT-3 - 1879 hours. The following conclusions are made: (1) the DD 787-1 card, in its present form, can be used as a vehicle for data collection to measure equipment reliability.. (2) quality of DD 787-1 failure reports received from the various sites indicate that a strong educational program is desirable for maintenance personnel. The differences in reliability estimates on the Feasibility Study as compared with the Original Study, although statistically significant, were not large in actual magnitude. The Reliability Index on the Feasibility Study was 151 bits (.2%/1000 hours); on the Original Study this index was 259 bits (.3%/1000 hours). (Author)

PB 157 731 $9.10

RCA Service Co., Camden, N. J.
MEASUREMENT OF THE EFFECTS OF ENVIRONMENT ON AIR FORCE ELECTRONIC EQUIPMENT RELIABILITY, by R. A. Miles. Final engineering rept. on Contract AF 30(602)1623. 15 Nov 59, 106p. 11 refs. Rept. no. R-3-59; RADC-TR-59-216; AD-232 232.

DESCRIPTORS: *Electronic equipment, Reliability, Temperature, Humidity, *Search radar, Test methods, Measurement, Data processing systems, Air force equipment.

From the results of the study the following conclusions are made. Equipment reliability is significantly higher than the original study. The lower reliability index (0.158% failures per 1000 hours) is due to the higher reliabilities of the AN/FPS-20 and AN/GPS-4. Replacement rates are approximately 12% less than the original study. The lower rate is due to incompleteness of

past history data. Outside temperature and humidity significantly affected the reliability of lower-mounted portions of the AN/FPS-3. Failures were significantly high during periods of high temperature and humidity. Line voltage variation had no significant effect on equipment reliability. There appeared to be no individual site condition which contributed significantly to equipment reliability. Scoring of site questionnaires reflected an overall average of approximately 82% satisfactory site conditions. The maintainability index is approximately two man-hours maintenance per 1000 hours of operation for each 100 parts of equipment complexity, as compared with three man-hours for the original study. The increased maintainability is due to the use of newer models of radar equipment. (Author)

PB 152 083 $14.00

Rensselaer Polytechnic Inst., Troy, N. Y.
AN INVESTIGATION OF PROBLEMS ASSOCIATED WITH BROADBAND INTERFERENCE MEASUREMENTS, by Edgar W. Matthews, Jr., Frederick J. Norvik and others. Final rept. 19 Nov 55-31 Dec 57, on Contract DA 36-039-sc-70177. [1958] 203p. 34 refs. AD-208 241.

DESCRIPTORS: *Radio interference, Measurement, Broadband, *Antenna couplers, Calibration, High frequency, Impedance, Radio communication systems, Circuits.

This final report incorporates a summary of the work accomplished and the results obtained during the entire project and a detailed discussion of work performed during the final period, including: (a) analysis of a low-frequency antenna coupling circuit using a tuned input transformer to prevent overloading of input stages by high level signals outside the desired frequency band; development of suitable input transformers for this purpose, with encouraging results; (b) additional measurements of the characteristics of several high-frequency baluns; (c) new calibration of the overall antenna-balun-injection system using a standard transmitting antenna method, in the high frequency range (65 to 1000 mc/s); results differ considerably from those of previous method, and show satisfactory sensitivity up to 600 mc/s; and (d) completion of theoretical analysis of the characteristics of the V-biconical antenna, with formulas for input impedance and fields. (Author)

PB 152 507 $5.60

Rensselaer Polytechnic Inst., Troy, N. Y.
AN INVESTIGATION OF PROBLEMS ASSOCIATED WITH BROADBAND INTERFERENCE MEASUREMENTS, by Frederick J. Norvik and Nasakazu Oshima. Final rept. 1 Feb-31 Oct 58, on Contract DA 36-039-sc-75038. [1958] 56p. 14 refs. AD-213 571.

DESCRIPTORS: Antenna couplers, *Radio interference, Broadband, Measurement, Conical antennas, Wave transmission, Coaxial cables, Resonance, *Impedance, Ferrites, Test methods, Transformers.

Measurements on conical antennas using small ground plane provide useful impedance characteristics. The impedance of a 60-degree cone angle antenna is in the vicinity of 200-ohms above its first resonance. A broadband balun having a 4:1 impedance ratio has been constructed using ferrite rings to minimize shunt impedance effects. The transmission of the balanced signal is maintained within 2 db over a frequency range from 60 mc./sec. to 1000 mc./sec. The unbalanced transmission component is attenuated at least 33 db over this range. The use of 93-ohm coaxial cable within the balun unit allows transformation from a 50-ohm unbalanced system to a 200-ohm balanced circuit. The V.S.W.R. for such a circuit was less than 2.5 over the above frequency range. Calculated and measured sensitivities are compared in the low frequency region (175 to 350 kc./sec.) which show good agreement for the given assumptions. The use of transformers as phase inverters and phase reverters in the low frequency range is practical, but the use of the transformer in conjunction with the tunable increductors limits the effective tuning range of that circuit. A discussion on the effect of unbalanced circuit impedances on the measurement of balanced signals shows the need for further study of the unbalanced impedances. Possible uses for special anechoic chamber for vhf measurements are suggested.

SCTM-297-58-(14) $2.60

Sandia Corp., Albuquerque, N. Mex.
RESISTORS AND THEIR APPLICATIONS, by R. L. Davis. Rept. on Contract AT(29-1)-789. 19 Aug 58, 24p.

SCTM-62-61(14) $2.60

Sandia Corp., Albuquerque, N. Mex.
A STUDY OF PULSE VOLTAGES DEVELOPED BY COAXIAL CABLES DURING PULSED NEUTRON IRRADIATION, by James M. Caller. Apr 61, 27p.

SCTM-166-59(52) $1.60

Sandia Corp., Albuquerque, N. Mex.
TRANSISTORIZED AUDIO AMPLIFIER PA-10W-1A, by Melvin H. Brock. May 60, 10p.

PB 154 520 $8.10

Scientific Radio Products, Inc., Loveland, Colo.
DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Donald L. Hammond and Paul E. Bryan. Final rept. 31 Oct 57-31 Jan 59, on Contract DA 36-039-sc-73007. [1959] 87p. 3 refs. AD-218 854.

DESCRIPTORS: Aging, Design, Frequency, Temperature, Vibration, Shock resistance, Capacitance bridges, Quartz crystals, *Quartz resonators, *Crystal oscillators.

The design and development of moderate precision fundamental mode crystal units in the frequency range between 5.0 and 20.0 MC is discussed. Complete data for 10 discreet frequencies in this frequency range are given. A description is given of a practical bridge network for the measurement of frequency with an accuracy of one part in ten to the minus eighth using crystal units with a Q between 10,000 and 30,000. Aging data is presented which shows that presently developed moderate precision crystal units in the frequency range between 5.0 and 20.0 MC are marginal in performance with respect to secular stability. Performance characteristics including typical temperature coefficient of frequency, inductance, resistance, amplitude coefficient of frequency are presented. The superior Q and freedom from unwanted modes in third overtone resonators in the frequency range between 11.5 and 20.0 MC are reviewed. (Author) (See also PB 140 648)

PB 154 201 $4.60

Sonotone Corp., Elmsford, N. Y.
DESIGN AND MANUFACTURE OF SEALED NICKEL-CADMIUM CELLS OF CYLINDRICAL DESIGN TO SIGNAL CORPS TECHNICAL REQUIREMENT SCL-7504, by Francis J. Alliegro and Herbert Bilsky. Quarterly progress rept. no. 2, 1 Mar-31 May 60, on Contract DA 36-039-sc-84496. [1960] 50p. 4 refs. AD-242 774.

DESCRIPTORS: *Alkaline cells, Nickel, Cadmium, Design, Manufacturing methods, Seals, Cylindrical bodies.

The first prototype cells were completed and initial cycling data was obtained from these cells. Life cycling equipment completed. Second series of prototypes are under construction. Plates in these cells will be overloaded approximately 35%, and positive plates will contain cobalt. These cells are designed to meet a proposed general specification on sealed nickel-cadmium cells. Promising results obtained on substitute for paper separator. Program for testing of glass and teflon seals was begun. (Author) (See also PB 150 449)

PB 155 741 $3.60

Sonotone Corp., Elmsford, N. Y.
DESIGN AND MANUFACTURE OF SEALED NICKEL-CADMIUM CELLS OF CYLINDRICAL DESIGN TO SIGNAL CORPS TECHNICAL REQUIREMENT SCL-7504, by Francis J. Alliegro. Quarterly progress rept. no. 3, 1 June-31 Aug 60, on Contract DA 36-039-sc-84496. [1960] 38p. 5 refs. AD-248 931.

DESCRIPTORS: Manufacturing methods, Design, Cylindrical bodies, *Alkaline cells, Seals, Nickel, Cadmium, Glass seals, Nylon gaskets.

The life cycle requirements were modified in order to improve the energy to weight ratio. The discharge was increased from 10 to 20% of the nominal capacity on life cycling; the cells are to yield 75% of cell capacity to 1.0v at a 3C5 discharge rate; and at minus 40 degrees F to yield 50% of cell capacity of 0.6V at the C5 rate. Life cycling data are presented for the first series of prototype cells. An investigation was begun on the effects of electrolyte concentration on the performance at minus 40 degrees F. During vibration tests on 50- and 100-amp hr cells, some of the contact tabs were twisted from their respective plates which indicated that provision must be made for core immobilization and support. On the basis of the data accumulated, the proposed cell design incorporates (1) 0.023-in. thick plates, (2) Co in positive plates, (3) 9 sq. in. of positive plate area per amp hr of nominal capacity, (4) filling cells with 40% KOH, and (5) 0.007 to 0.008 in. of plate separation. Woven nylon may be used as a separator material, but a non-woven sheet material of polypropylene is being investigated. (See also PB 154 201)

PB 153 048 $6.60

Sylvania Electric Products, Inc., Bayside, N. Y.
DEVELOPMENT OF A BACKWARD WAVE LOCAL OSCILLATOR TUBE. Final rept. on Contract DA 36-039-sc-70178. [1959] 68p. 5 refs. Rept. no. YD-56-4-6; AD-211 799.

DESCRIPTORS: Oscillators, Oscillator circuits, Design, *Backward-wave oscillators, Radiofrequency, Microwave networks, Tests, X-band, *Electron tube oscillators, *Electron guns, Electron beams.

This report discusses the design, construction and performance of an experimental backward wave oscillator electronically tunable over a frequency range of 60 to 75 kMc. A minimum power output of one milliwatt and an average power output of four milliwatts over the tuning range has been achieved with the best tubes built. The tube is solenoid focused, operates at a maximum beam voltage of 1850 volts and a cathode current of 15 to 25 ma. The construction is all metal and ceramic and the r.f. output connector is a standard RG-98/U waveguide flange. The slow wave circuit structure consists of a ridged rectangular waveguide with a series of transverse slots in the broad wall opposite the ridge. A broadband ceramic vacuum and microwave window, brazed into the metal tube envelope, transmits microwave energy from the above r.f. structure to an external waveguide adaptor. The tube incorporates a parallel flow electron gun using an impregnated cathode. Fifteen tubes were built and five r.f. circuit design modifications were studied.

PB 157 821 $4.60

Texas Instruments, Inc., Dallas.
LOW-TEMPERATURE MICROWAVE CRYSTAL, by J. M. McMillin, C. F. Davis, Jr. and R. L. Petritz. Final engineering rept. 11 June 57-26 Oct 59, on Contract AF 30(602)1716. 26 Oct 59, 45p. 11 refs. Rept. no. 8-39405-8; RADC-TR-59-226; AD-231 221.

DESCRIPTORS: *Crystals, Low temperature research, Microwave equipment, Diodes, *Crystal mixers, S-band, Broadband.

A summary of the various fabrication techniques investigated is presented as well as a comparative evaluation of characteristics of cooled mixers and state-of-the-art silicon mixers. Cooled mixers show overall receiver noise figure characteristics comparable with conventional mixers. Cooled mixers also show reduced noise temperatures. This represents a significant accomplishment considering the very recent development of both the material and its technology. Overall broadband-receiver noise figures of as low as 8.8 db have been obtained by a few units, although most units run 11 db and higher. The noise temperature of the best units runs about 1.0. This compares with a noise figure of 7.5 db and a noise temperature of 1.2 for conventional mixers used in the S-band. (Author)

PB 157 727 $1.60

Westinghouse Electric Corp., Baltimore, Md.
COUPLER, ANTENNA CU-640( )/GR, by Franklin G. Lee. Technical rept. on Contract AF 30(602)1941. [1959] 19p. RADC-TR-59-209; AD-230 516.

DESCRIPTORS: *Antenna couplers, Tests, Operation, Maintenance, Sensitivity, Reliability, Impedance, Very high frequency, Circuits, Transistors, Distributed amplifiers.

Operating characteristics of the CU-640( )/GR antenna coupler developed on this program are discussed in detail. Some of the important characteristics considered are; noise figure, intermodulation distortion, gain and isolation between outputs. This equipment meets all of the performance requirements of the specification Exhibit RADC-1995, 18 November 1957 as modified by Amendment No. 1, 26 March 1958 and changes requested by letter of March 1959. It is recommended that this antenna coupler be used in installations where signal levels do not ordinarily exceed 1 VRMS. When this coupler is used with typical receivers, even a low noise unit such as the Nems Clark 1302, the coupler-receiver sensitivity will be equal or nearly equal to the receiver alone over the entire range of the coupler. (Author)

Ordnance, Missiles, and Satellite Vehicles

PB 155 887 $7.60

Air Force Missile Development Center, Holloman AFB, N. Mex.
GUIDANCE SYSTEM TESTING AT THE AIR FORCE MISSILE DEVELOPMENT CENTER 1960, by David Bushnell. Mar 61, 74p. 73 refs.

DESCRIPTORS: *Guided missiles, Guided missile research, Guidance, Guided missile computers, Guided missile launchers, Programming, Surface to surface, Rocket propelled sleds, Test vehicles, *Tracks (Aerodynamics), *Inertial guidance, Control systems.

The Air Force Central Inertial Guidance Test Facility: Progress and problems; resources and organization; guidance laboratory development; project 5177; project 6889; laboratory test programs; notes

Another year of guidance testing on the Holloman track; sled problems; minuteman (weapon system 133A); titan (weapon system 107A-2); additional CIGTF track programs; army guidance testing on the Holloman track notes

PB 157 950 $1.60

Army Ordnance Corps, Washington, D. C
SAFETY REQUIREMENTS FOR MANUFACTURING DOUBLE-BASE SOLVENTLESS PROPELLANTS. 1 Oct 60, ORDM 7-227, supersedes ORDM 7-227, 1 Sep 52.

DESCRIPTORS: *Safety, Explosives, Hazards, Storage, Classification, Nitroglycerin, Nitrocellulose, Solid rocket propellants, Rocket propellants, Rocket oxidizers, Rocket fuels, Production, *Propellants.

PB 171 809 $7.00

Cryogenic Engineering Lab., National Bureau of Standards, Boulder, Colo.
CRYOGENIC MATERIALS DATA HANDBOOK, by T. F. Durham, R. M. McClintock, and R. P. Reed. Rept. on Contract AF 04(647)59-3. Aug 61, 525p. Supersedes PB 161 093-(1-5).

DESCRIPTORS: *Cryogenics, Metals, Materials, *Guided missiles, Physical properties, Low temperature research, Aluminum, Stainless steel, Handbooks, Cobalt, Copper, Iron, Nickel, Titanium, Carbides, Beryllium, Molybdenum, Ice, Nylon, Plastics.

This handbook of data on solid materials at low temperatures deals with physical properties of certain metals and non-metals over the temperature range minus 454°F to plus 500°F. The materials selected for inclusion in the handbook are limited to aluminum, cobalt, copper, iron, nickel, titanium, carbides, non-metals, and miscellaneous metals and alloys. The materials are mostly those in current use for missile applications at cryogenic temperatures, but a few have been included because of their potential for such uses. This compilation of some of the mechanical properties of materials should assist the designer by making available in one publication reliable data which have appeared in the literature or which have not yet been published.

PB 171 809-1 $1.00, $4.00/year

Cryogenic Engineering Lab., National Bureau of Standards, Boulder, Colo.
CRYOGENIC MATERIALS DATA HANDBOOK. Quarterly supplement no. 1 on Contract AF 04(647)59-3. [1961] 75p.

DESCRIPTORS: *Cryogenics, Metals, Materials, *Guided missiles, Physical properties, Low temperature research, Aluminum, Cobalt, Copper, Iron, Nickel, Titanium, Carbides, Beryllium, Molybdenum, Handbooks, Steel, Ice, Nylon, Plastics

See PB 171 809

AD-256 900 $9.10

Dielectrics Lab., Johns Hopkins U., Baltimore, Md.
DIELECTRICS FOR SATELLITES AND SPACE VEHICLES, by Louis J. Frisco. Interim rept. no. 2, 1 May 60-28 Feb 61, on Contract DA 36-039-sc-78321. 15 Mar 61, 82p. 17 refs.

This report released by the Coquizant Military Agency for sale to the public 8 Sep 61.

DESCRIPTORS: *Dielectrics, Upper atmosphere, *Space environmental conditions, Electrical properties, Insulating materials, *Electric insulation, Dielectric properties, X-rays, Ultraviolet radiation, Conductivity, Tests, Materials, *Satellite vehicles, *Spaceships, Glass textiles, Ceramic materials, Resins, Laminates, Plastics.

Results of the second phase of a study of the effects of simulated high altitude environment on the electrical properties of insulating materials are reported. High vacuum breakdown and flashover measurements in the 10 to the 6th power mmHg range at d-c, 60-cps, 2-mc and 18-mc indicate that electrode surface roughness is the controlling factor. Dielectric properties of the specimen material do not influence flashover voltage. X-ray and ultraviolet radiation have no effect on flashover voltage. Significant changes in low-frequency loss properties and d-c conductivity were observed during and after vacuum irradiation with 50-KV x-rays. Ultraviolet radiation produced no immediate effects on loss properties. (Author)

UCRL-6445 $2.60

Lawrence Radiation Lab., U. of California [Berkeley].
EXCAVATION OF CONTAINED TNT EXPLOSIONS IN TUFF, by Nicholas M. Short. Rept. on Contract W-7405-eng-48. 18 Apr 61, 26p.

AD-255 723 repriced $1.00

Naval Ordnance Lab., White Oak, Md.
A RADIO-FREQUENCY BURST SOURCE FOR ELECTRO-EXPLOSIVE DEVICE TESTING, by Louis A. Rosenthal. Rept. on HERO (Hazards of Electro-Magnetic Radiation to Ordnance). 27 Jan 61, 31p. 2 refs. NAVWEPS rept. 7354.

DESCRIPTORS: *Radiofrequency pulses, Design, Theory, *Electric detonators, Sensitivity, *Electric igniters, Pulse generators, Test equipment, Resistance, Mathematical analysis, Radiofrequency generators, Hazards, Radiofrequency oscillators, Electromagnetic waves.

The principles and design of a 5 megacycle burst source for electro-explosive device testing are developed. The source is capable of delivering 100-watt power bursts for pulse widths of 100 to 11,000 microseconds. The application to firing studies and techniques for evaluating observed traces are presented. (Author)

PB 157 972 $1.60

Picatinny Arsenal, Dover, N. J.
STUDY OF EXPLOSIVES DERIVED FROM NITROPARAFFINS, by Wm. H. Rinkenbach and H. Aaronson. Rept. no. 1 (Final). 24 Oct 41, 13p. 1 ref. Technical rept. no. 1125.

DESCRIPTORS: *Explosives, *Nitroglycerin, *Nitrocellulose, Synthesis, *Nitrates, Smokeless propellants, Detonation, Stability, *Hydroxides.

A number of nitroparaffins and their derivatives have recently become commercially available. The nitrated derivatives of three hydroxyl compounds derived from such nitroparaffins were prepared and their properties studied. These were: (a) nitroisobutylglycerintrinitrate; (b) 2 nitro-2 methyl-1, 3 propanedioldinitrate; and (c) 2 nitro-2 methyl-1 propanolnitrate. The first two are highly brisant explosives, but unstable. The third compound is non-explosive, and is a good gelatinizing agent for nitrocellulose, but is also unstable. Although the three compounds are considered unsuitable for use as military explosives due to their instability, the general process for synthesizing this type of explosive compounds offers possibilities for the preparation in high yield of other compounds of more satisfactory characteristics. (Author)

PB 155 735 $4.60

Radiation Lab., U. of Michigan, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS. 43. PLASMA SHEATH SURROUNDING A CONDUCTING SPHERICAL SATELLITE AND THE EFFECT ON RADAR CROSS SECTION, by Kun-mu Chen. Rept. on Contract DA 36-039-sc-75041. Oct 60, 50p. 5 refs. 2764-6-T; ARPA Order no. 120-60; AD-250 805.

DESCRIPTORS: *Radar echo areas, *Plasma physics, Satellite vehicles, Density, Ions, Electrons.

Means for computing the radar cross section of objects in a variety of different environments was investigated. An extension of the investigation included not only the standard boundary-value problems, but also such topics as the emission and propagation of electromagnetic and acoustic waves, and phenomena connected with ionized media. An experimental program was considered which embraces (1) measurement of antennas and radar scatterers in order to verify data determined theoretically; (2) investigation of antenna behavior and cross section problems not amenable to theoretical solution; (3) problems associated with the design and development of microwave absorbers; and (4) low and high density ionization phenomena. The plasma sheath surrounding a conducting spherical satellite is studied. The density distributions of the positive ions and the electrons in the space are obtained respectively. The satellite is assumed to be charged and the potential of the satellite is determined. The change of the radar cross section of the satellite due to the plasma sheath is evaluated. (Author)

PB 156 772 $1.10

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND FABRICATION OF PERCUSSION PRIMER FOR BAG LOADED WEAPONS, by R. A. Sahlin. Monthly progress rept. for 1-28 Feb 61 on Contract DA 19-020-ORD-5200. 14 Mar 61, 3p.

DESCRIPTORS: *Primers, Design, *Weapons

Work is in progress on sub-assemblies and final deliveries on the primer bodies are expected. (See also PB 156 771)

SCR-406 $1.60

Sandia Corp., Albuquerque, N. Mex.
EXPLOSIVE CRATERING EXPERIMENTS, by L. J. Vortman. May 61, 10p.

Sanitation and Safety Engineering

NAA-SR-M-6298 $1.60

Atomics International, Canoga Park, Calif.
NUCLEAR SAFETY IN HANDLING LONG FUEL RODS, by N. Ketzlach. 18 Apr 61, 20p.

NAA-SR-M-6006 $3.60

Atomics International, Canoga Park, Calif.
A SURVEY OF THE ASSUMPTIONS AND AREAS OF UNCERTAINTY IN OMR HAZARDS EVALUATION, by W. P. Kunkel. [1960] 34p.

HW-62111 $5.60

Hanford Atomic Products Operation, Richland, Wash.
PRTR HIGH PRESSURE LOOP HAZARDS SURVEY OF PRELIMINARY SCOPE DESIGN, by J. K. Anderson and P. C. Walkup. Rept. on Contract AT(45-1)-1350. 15 Oct 59, 58p.

HW-SA-1962 $4.60

Hanford Atomic Products Operation, Richland, Wash.
RADIATION PROTECTION STANDARDS: THEORY AND APPLICATION, by Herbert M. Parker. Rept. on Contract AT(45-1)-1350. 24 Aug 60, 41p.

PB 154 911 $7.60

Minnesota Dept. of Health, Minneapolis.
AN APPRAISAL OF AIR POLLUTION IN MINNESOTA, by George J. Raschka. Rept. for Oct 59-July 60. Jan 61, 78p. 79 refs.

DESCRIPTORS: Minnesota, *Air, *Public health, Sampling, *Contamination, Sanitary engineering, Urban areas.

Contents:
Effects of air pollution
Sources of air pollution
Air sampling activities
Weather and terrain
Population
Legislative patterns
Metropolitan area problems

CF-61-5-90 $1.60

Oak Ridge National Lab., Tenn.
THE LABORATORY DIRECTOR'S REVIEW COMMITTEES AT ORNL, by Francois Kertesz. 10 May 61, 17p.

NAA-SR-M-2917 $1.60

Atomics International, Canoga Park, Calif.
OMR ORGANIC FIRE AND EXPLOSION HAZARD STUDY, 12eMW, by R. A. Sheldon. 24 July 58, 12p.

FOOD, HANDLING, AND PACKAGING EQUIPMENT

AD-260 894 Repriced $3.00

Quartermaster Research and Engineering Center, Natick, Mass.
PRESERVATION OF FOOD BY LOW-DOSE IONIZING ENERGY, by Dale H. Sieling. Jan 61, 171p. 248 refs.

DESCRIPTORS: *Food, *Preservation, Radiation effects, Meat, Packaging, Storage, Acceptability, Dose rate, Pasteurization, Vegetables, Fruits, Ionization, Radioactivity, Nuclear energy.

Contents:
Introduction
Action of low-dose ionizing energy on individual foods
Acceptability of foods preserved by low-dose radiation
Technological aspects
Economics of low-dose irradiation processing
Potentialities of radiation preservation of food

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 157 720 $4.60

Princeton U., N. J.
COMBUSTION INSTABILITY IN SOLID ROCKETS USING PROPELLANTS WITH SUSPENDED METALLIC POWDERS, by Sin-I Cheng. Rept. on Contract AF 49 (638)465. Sep 59, 41p. 2 refs. Rept. no. 482; AFOSR-TN-59-1002; AD-231 172.

DESCRIPTORS: *Solid rocket propellants, Combustion, Stability, *Rocket motors, Metals, Powders, Additives, *Jet acoustic oscillations, Oxidation.

The stability of the acoustic oscillations in the chamber of a solid propellant rocket is analyzed to reveal the effect of the addition of the metallic powders to a basic solid propellant. The dissipative action of the oscillation of the particles in the condensed phases is neglected. The oxidation of the metallic powders is considered as distributed heat sources to the gas system. The heat addition distorts the acoustic field through the variation of the speed of sound over the chamber volume. This modifies the non-dissipative damping action of the supercritical nozzle. The rate of heat release from the metallic powders may fluctuate but lag behind the local gas oscillation. This oscillatory heat source from the oxidation of the metallic powders, like the oscillatory mass source from the combustion of the basic propellant, can excite unstable oscillations of the gas system. The two exciting forces are, however, out of phase, in general, and may or may not counteract each other. (Author)

Machine Parts and Mechanisms

NAA-SR-M-5951 $1.60

Atomics International, Canoga Park, Calif.
STATIC SODIUM TEST OF WESTINGHOUSE FLOW CONTROLLER BEARING, by R. Cygan. 8 Dec 60, 8p.

CF-61-5-109 $2.60

Oak Ridge National Lab., Tenn.
USE OF A STANDARD ORIFICE IN THE CALIBRATION OF VACUUM GAUGES, by C. E. Normand. 4 May 61, 23p.

SCR-292 $2.60

Sandia Corp., Albuquerque, N. Mex.
SPECIAL GAGE DESIGNS FOR POSITIONALLY TOLERANCED PARTS, by Edward S. Roth. Apr 61, 23p.

Manufacturing Equipment and Processes

HW-63266 $0.75

Hanford Atomic Products Operation, Richland, Wash.
TAPPING SMALL HOLES IN UNALLOYED PLUTONIUM, by J. H. Rector and W. B. Weihermiller. Rept. on Contract AT(45-1)-1350. Feb 61, 26p.

SCTM-115-61(25) $0.75

Sandia Corp., Albuquerque, N. Mex.
THE AUTOMATION OF PRODUCT TESTERS, by C. C. Klutts. Aug 61, 24p.

MATERIALS

PB 152 711 $2.60

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
COMBINED DEVELOPMENT AND FIXATION OF PHOTOGRAPHIC IMAGES WITH MONOBATHS, by Marilyn Levy. 20 Jan 58, 24p. 45 refs. Technical memo. no. M-1939; AD-160 082.

DESCRIPTORS: *Photographic chemicals, High speed photography, Photographic equipment, Photographic film, Photographic paper, Processing, Photographic plates, Photographic emulsions, Optical images.

A combined developing and fixing bath is described that retains, to a marked degree, the sensitometric characteristics of conventionally developed film and paper. An evaluation of the system is made, based on changes in formulation and processing conditions. The utilization of the monobath as a high-speed developer is also discussed.

PB 153 869 $2.60

Army Signal [Research and Development] Lab., Fort Monmouth, N. J.
EVALUATION OF CHEMICAL SURFACE TREATMENTS APPLIED TO ALUMINUM, by Stanley Firestone. 20 June 57, 22p. 2 refs. Technical memo. no. M-1897: AD-158 049.

DESCRIPTORS: *Electronic equipment, Materials, Aluminum, Tests, *Corrosion inhibition, Oils, Coatings.

Eleven proprietary chemical surface treatments, one electrolytic surface treatment (Anodizing), and one pretreatment coating ("Wash Primer") were evaluated. Both painted and unpainted surface treated aluminum panels were prepared. They were subjected to salt spray and two types of moisture resistance cycles. More than 2100 panels were evaluated. All chemical surface treatments evaluated compared favorably with anodizing in inhibiting corrosion of aluminum. The "wash primer", used in lieu of any surface treatment, was found to be a satisfactory means of improving adhesion and flexibility of paint-aluminum systems. (Author)

PB 156 913 $1.60

Battelle Memorial Inst., Columbus, Ohio.
RESEARCH FOR UNDERSTANDING MECHANISMS OF FLAME INHIBITION, by Arthur Levy, J. W. Droege and others. Quarterly progress rept. no. 3, 15 Mar-15 June 59, on Contract DA 44-009-eng-3765. 9 July 59, 17p. 5 refs. AD-225 864.

DESCRIPTORS: *Flame propagation, *Inhibition, Measurement, Gas flow, Mathematical analysis, *Methanes, Chemical analysis, Combustion, Mass spectroscopy

Measurements of flame speed were obtained by determining the flame core area, S = V/A, where S is the

flame speed, V is the volume rate of flow of gas, and A is the area of the cone. Methane-air flame speeds for CH_4 volume percentages of 7, 9.5, and 12 were measured as 23, 40, and 25 cm/sec, respectively. Flame analysis experiments were conducted by using dry air and research grade methane. The flame front was traversed with a quartz probe on three days. Each sample was analyzed in the spectrometer within about 20 min after it was withdrawn. Primary data on flame analysis were imperfect because of the variation of the methane composition, the error in water analysis, and the instabilities of the CO and N ratios. A hydrogen balance was assumed, and the water concentration was calculated from the starting concentration of methane and the analyses of other H-containing compounds. By assuming that a C balance was also maintained, the CO concentrations were calculated. From these data there were calculated the compositions of the gases from lean flames at distances of 4.046, 4.051, and 4.068 in. inside the luminous zone. The adiabatic flame temperatures were also calculated.

PB 157 828 $22.25

Chemical Corps, Army Chemical Center, Md.
MILITARY SPECIFICATIONS: DETECTOR KIT, CHEMICAL AGENT, ABC-M18. 2 May 61, 412p. MIL-D-51030A, supersedes MIL-D-51030(CmlC), 27 July 60.

DESCRIPTORS: *Military requirements, *Specifications, Detectors, Plastics, Phenolic resins, Chemical warfare agents, Paper, Waxes, Insulating materials, Electric insulation, Enamel coatings, Air, Sampling, Containers, Electric insulating tapes, Cordage, Drafting, Vesicants, Safety, Sodium compounds, Peroxides, Amines, Phenyl radicals, Sulfur compounds, Federal government, Glass, Pencils, Ink.

PB 154 547 $3.60

Quartermaster Research and Engineering Command, Natick, Mass.
THE DEVELOPMENT OF A TWO-MAN MILITARY TENT, by Conway W. Weikert. Feb 61, 31p. Textile Series rept. no. 115; AD-252 606.

DESCRIPTORS: *Fire resistant textiles, *Portable shelters, *Tents, Textiles, Design, Arctic regions, Military research, Military requirements, Moisture-proofing, Synthetic fibers.

The development of the two-man tent now standard for mountain and arctic use is reviewed. Eighteen tents, most of which were designed under the auspices of the Quartermaster research and development program, were field-tested in an effort to arrive at a lightweight, durable, and functionally satisfactory item. In spite of the variety of sizes and constructions studied, those of the early Quartermaster-developed Mountain tent could not be improved upon. Weight of the tent fabric, however, still remains a problem and further study and application of new lightweight synthetic fibers and new multi-purpose finishes is indicated. (Author)

Ceramics and Refractories

GA-2268 $1.60

Battelle Memorial Inst., Columbus, Ohio.
IRRADIATION OF BeO-UO_2 CERAMICS, by D. E. Johnson, J. Koretzky, and A. K. Smalley. Rept. on Contracts W-7405-eng-92 and AT(04-3)-187.

NYO-9834 $1.10

Mound Lab., Miamisburg, Ohio; Owens-Corning Fiberglass Co., Granville, Ohio; and Rensselaer Polytechnic Inst., Troy, N. Y.
PLUTONIUM BEARING GLASS, by L. V. Jones, P. Lockwood and others. Progress rept. for July 60-Mar 61 on Contract AT(30-3)-321, Task 1. 1 July 61, 8p.

Plastics

AD-260 252 repriced $0.75

Naval Ordnance Lab., White Oak, Md.
THERMAL DEGRADATION OF PHENOLIC POLYMERS, by Hugh C. Anderson. 23 Jan 61, 27p. 7 refs. NAVWEPS rept. 7379.

DESCRIPTORS: *Phenolic resins, *Heat resistant polymers, *Pyrolysis, Resins, Polymers, Copolymerization, Polymerization, Chlorides, Silanes, Nylon, Furaldehydes, Phenols, Molecular structure, Decomposition, Gravimetric analysis, Plastics, Glass textiles, Formaldehyde, Carbonization.

A study has been made of the thermal decomposition of 15 phenolic polymers, using vacuum thermogravimetry as a tool. These polymers included regular phenolics, chlorinated phenolics, and phenolics copolymerized with silane, nylon and phenol-furfural resins. The results are discussed in relationship to the chemistry of phenolic polymers. A high crosslink density and the large concentration of aromatic groups in these polymers are thought to be the causes of their carbonization and slow decomposition characteristics. (Author)

PB 146 912 $3.60

Plastics Lab., Princeton U., N. J.
THE BEHAVIOR OF POLYISOBUTYLENE DURING MELT SHEAR, by Herbert A. Pohl and Costas G. Gogos. Rept. on Contract DA 36-039-sc-78105. 12 Apr 60, 34p. 32 refs. Technical rept. 57B; AD-236 465.

DESCRIPTORS: *Butenes, *Polymers, Shear stresses, Melting, Viscosity, Molecular weight, Torque, Measurement, Polymerization, Chemical bonds, Rupture, Plastics.

Studies were made of the apparent melt viscosity and chain rupture of polyisobutylene melts during high mechanical shear at various temperatures, and for varied

times of shearing action by means of a biconical rheometer. Investigation of the chain rupture rate, made by examination of dilute solution viscosities and the viscosities and the viscosity average molecular weight determined from them, showed the rate of chain degradation to decrease as the temperature during the shearing operation is raised. The chain rupture rate decreases steadily as shearing is continued, and increased with increase of shear rate at a given temperature and time of shear application. The apparent melt viscosity which decreases sharply to a pseudo steady state value shortly after intense shear begins, appears to be due to 2 processes: (1) the rapid breakdown of the chain-like molecules to smaller fragments forming, mainly, free radicals or ion pairs at their ends; these reactive ends begin immediately to recombine at a rate which increases with the rise in their concentration until the pseudo equilibrium state is reached; and (2) chain disentanglement and the preferential migration of holes in the liquid, away from the center of gravity of the chains, to form regions of low viscosity which may be termed fault lines or regions.

MATHEMATICS

AGN-TM-392 $1.50

Aerojet-General Nucleonics, San Ramon, Calif.
2DXY TWO DIMENSIONAL, CARTESIAN COORDINATE Sn TRANSPORT CALCULATION, by J. Bengston, S. T. Perkins and others. Rept. on Contract AT(10-1)-880. June 61, 60p.

WAPD-T-1205 $2.60

Bettis Atomic Power Lab., Pittsburgh, Pa.
THE ANALOG NON-LINEAR SYSTEM ANALYZER, by William H. Alliston. Rept. on Contract AT-11-1-GEN-14. May 60, 23p.

WAPD-TM-230 $1.25

Bettis Atomic Power Lab., Pittsburgh, Pa.
PDQ-4: A PROGRAM FOR THE SOLUTION OF THE NEUTRON-DIFFUSION EQUATIONS IN TWO DIMENSIONS ON THE PHILCO-2000, by W. R. Cadwell. Rept. on Contract AT-11-1-GEN-14. June 61, 50p.

LAMS-2551 $3.60

Los Alamos Scientific Lab., N. Mex.
A PROPOSAL FOR THE USE OF THE METHOD OF CHARACTERISTICS AS A CONDITION ON THE NUMERICAL SOLUTIONS OF TWO-DIMENSIONAL LAGRANGIAN ISENTROPIC FLOW, by Christian D. Anderson. Rept. on Contract W-7405-eng-36. Apr 61, 38p.

PB 156 820 $3.60

Minnesota U. School of Business Administration, Minneapolis.
THE WILCOXON TWO SAMPLE STATISTIC, by James E. Jacobson. Special rept. no. 2 on Contract Nonr-2582(00). 15 Aug 60, 39p. 57 refs. AD-245 332.

DESCRIPTORS: *Sampling, Statistical distributions, Statistical functions, Tables, Bibliography.

Tables for the Wilcoxon two sample statistic are presented, and the normal approximation to the Wilcoxon two sample statistic is considered. A compilation is presented of existing tables of the exact distribution of the Wilcoxon statistic, and a comparison is made of the exact distribution (in the tails) to the normal approximation. Some additional exact percentage points are computed for the Wilcoxon statistic. The following sections are also discussed: (1) Wilcoxon two sample statistic, (2) existing tables of the exact distribution of the statistic, (3) description of tables, (4) normal approximation, (5) continuity correction, and (6) computational method. (Author)

NYO-9745 $1.60

Rochester U., N. Y.
LOCAL FIELDS WITH TERMINATING EXPANSIONS, by K. Bardakci and E. C. G. Sudarshan. Rept. on Contract AT(30-1)-875. 2 June 61, 12p.

PB 153 983 $1.60

Watertown Arsenal Labs., Mass.
ASYMPTOTIC REPRESENTATION OF CERTAIN REAL INTEGRALS WITH VARIABLE LIMITS OF INTEGRATION, by E. W. Ross, Jr. Rept. on Basic Ordnance Research. Jan 61, 19p. 2 refs. Technical rept. WAL TR 810.2/1; AD-251 526.

DESCRIPTORS: *Integrals, Series.

A general asymptotic representation is found for real integrals of the form

$$f(x) = \int_{R(x)}^{c} G(t)\, e^{xN(t)}\, dt,$$

as $x \to \infty$. It is assumed that the asymptotic representations of R(x) as $x \to b < c$, and of G(t) and dN/dt as $t \to b$, are known. This result generalizes a formula given by Erdelyi for the case where R is independent of x. (Author)

Computing Devices

APDA-141 $2.60

Atomic Power Development Associates, Inc., Detroit, Mich.
HAFEVER AN INELASTIC SCATTERING CODE FOR THE IBM 704 COMPUTER, by M. A. Friedman and P. F. Zweifel. Sep 60, 28p.

HW-68862 $1.00

Hanford Atomic Products Operation, Richland, Wash.
A TABLE TO FACILITATE THE CALCULATION OF LIKELIHOOD RATIO TEST STATISTICS FOR HYPOTHESES CONCERNING GROUPED DATA, by W. L. Nicholson. Rept. on Contract AT(45-1)-1350. Mar 61, 30p.

KAPL-M-WBL-3 $2.60

Knolls Atomic Power Lab., Schenectady, N. Y.
EXPLICIT, A DIGITAL COMPUTER PROGRAM FOR PULSED NEUTRON DATA REDUCTION, by W. B. Leng. Rept on Contract W-31-109-eng-52. 14 Apr 61, 26p.

KAPL-M-MAK-1 $2.60

Knolls Atomic Power Lab., Schenectady, N. Y.
PTA PRESSURIZER PROGRAM TRANSIENT ANALYSIS, by M. A. Ketchum. Rept. on Contract W-31-109-eng-52. 16 May 61, 30p.

CF-61-6-59 $1.60

Oak Ridge National Lab., Tenn.
RCS, AN IBM-7090 PROGRAM FOR CALCULATION OF CROSS SECTIONS FROM RESONANCE PARAMETERS, by M. E. Tsagaris and C. A. Preskitt. 15 June 61, 12p.

PB 157 714 $8.60

Ohio State U. Research Foundation, Columbus.
LOROP SLIDE RULE, by Paul M. Pepper and Frederick J. Doyle. Final rept. on Contract AF 30(602)1838. Jan 60, corrected Apr 60. 100p. 8 refs. OSURF Proj. no. 824; RADC-TR-60-32; AD-235 250.

DESCRIPTORS: *Computers, Aerial photographs, Design, Photographic analysis, Aerial photography, *Mapping, Mathematical analysis.

The development of a special purpose slide rule is described for computing the dimensions and positions of objects appearing on oblique aerial photographs. Computing formulas are derived for both the general case and special cases occurring when the tilt is near 0^{o} or 90^{o}. The selection of the computing scales, their layout units, and location on the slide rule are described. (Author)

SCTM-94-61(24) $1.60

Sandia Corp., Albuquerque, N. Mex.
MILLIMICROSECOND SAMPLING, by N. J. Elliott and R. W. Seavey. Apr 61, 16p.

SCR-405 $1.10

Sandia Corp., Albuquerque, N. Mex.
SOME USEFUL APPLICATIONS OF ORED INDEX REGISTERS, by C. M. Williams. May 61, 9p

MECHANICS

NAA-SR-M-5230 $1.60

Atomics International, Canoga Park, Calif.
CYLINDRICAL SHELLS UNDER AXIALLY SYMMETRICAL THERMAL AND MECHANICAL LOADINGS, by C. O. Peinado. 16 Jan 61, 14p.

NAA-SR-M-4437 $1.60

Atomics International, Canoga Park, Calif.
DEFLECTION OF THE LOWER REACTOR VESSEL HEAD WHEN SUBJECTED TO A TRANSIENT TEMPERATURE CHANGE, by H. L. Sujata. 3 Nov 60, 15p.

BRL-1122 $1.75

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE AXISYMMETRIC MODES OF VIBRATION OF SPHERICAL SHELL, by Wilfred E. Baker. Dec 60, 48p.

UCRL-13001 $2.60

Colorado School of Mines Research Foundation, Inc. Golden
ON THE SUPERPOSITION OF TWO PLANE WAVES, by Jean-Pierre Fortin and John S. Rinehart. 20 Apr 61, 24p.

PB 157 741 $5.60

Princeton U., N. J.
THE BOUNDARY LAYER IN A CORNER, by Sin-I Cheng and Richard H. Levy. Rept. on Contract AF 49(638)465. Nov 59, 53p. 15 refs. Rept. no. 485; AFOSR-TN-59-1165; AD-232 955.

DESCRIPTORS: *Laminar boundary layer, Sheets, *Fluid flow, Compressible flow, Mathematical analysis, Series, Numerical analysis.

The problem of the incompressible boundary layer between 2 semiinfinite flat plates whose line of intersection is parallel to the incoming flow and whose leading edges are perpendicular to it is treated for arbitrary angle between the plates. A series expansion valid at small distances from the corner is developed; the first term is derived from consideration of the creeping flow in which convective forces are negligible compared to pressure and viscous forces. An

asymptotic solution is obtained for the case when the angle between the plates is less than π; it is based upon an estimate of the form of the flow in the transverse plane far from the corner which is generally nonvanishing in the boundary layer approximation. This solution is matched to the series solution for various values of the angle between the plates, and consistent numerical results are obtained. (Author)

SCTM-280-60(51) $1.10

Sandia Corp., Albuquerque, N. Mex.
THEORETICAL ANALYSIS OF THE MOTION IN THE WEIGHTLESSNESS TEST FACILITY., by M. D. Bennett. 1 Sep 60, 16p.

TID-12854 $4.60

Syracuse U. Research Inst., N. Y.
THE INFLUENCE OF THICKNESS-WISE TEMPERATURE GRADIENTS ON THE LARGE DEFLECTIONS AND STABILITY OF THIN ELASTIC SHELLS. PART I. SHALLOW CLAMPED SHELLS. PART II. COMPLETE SPHERICAL SHELLS. PART III. BIMETALLIC SHELLS, by C. Libove and K. N. Tong. Technical rept. on Contract W-7405-eng-26. Feb 61, 47p.

Aerodynamics and Pneumatics

PB 155 549 $7.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
SOME STUDIES OF COUETTE-TYPE FLOWS, by Jiro Kondo. Rept. on Contract AF 49(638)674. Jan 61, 78p. 13 refs. AFOSR-70.

DESCRIPTORS: Heat transfer, *Aerodynamic heating, *Compressible flow, *Gas flow, Mathematical analysis, Fluid flow, Boundary layer.

Some mathematical models are introduced and the exact treatment of compressible Couette-type flow is shown, although numerical results are not yet obtained. The simple Couette flow is obtained as the first approximation of the exact treatment, and some effects of mathematical models are investigated. Couette flow with air injection is solved and the solution is obtained in a closed form under certain conditions. This is the unique case where a cross flow exists and still the flow is uniform in the direction of the main flow. Numerical results are obtained. Couette flow of equilibrium dissociating air is analyzed and numerical examples assuming the specific heat of the gas at constant pressure, Cp , to be constant are shown. A method of improvement to include cases of variable Cp is suggested. (Author)

PB 155 318 $10.50

Hiller Aircraft Corp., Palo Alto, Calif.
VTOL DOWNWASH IMPINGEMENT STUDY. DUCT ADAPTER TEST PROGRAM, by A. Morse and H. Newhouse. Interim rept. on Contract DA 44-177-tc-655. Feb 61, 134p. Engineering rept. no. 60-88; TREC Technical rept. 61-34; AD-253 044.

DESCRIPTORS: *Vertical take-off planes, Gas flow, *Downwash, *Ducts, Ground effect, Nozzles, Surfaces, Erosion, Particles, Water, Jets

A cold air source of approximately 6 sq ft cross sectional area was provided by a mobile test rig. An adapter was fitted to the air source with two one-foot diam ducts that were tested at Z/D ratios from . 5 to 3 and at disk loadings between 8 and 150 lb/sq ft. The air source, without the use of adapters, provided the geometry for a plenum chamber type G. E. M. and an adapter was attached to simulate an annular nozzle type G. E. M. The G. E. M. configurations were tested at a height above the surface of . 25 ft (effective Z/D of approximately . 1) and at base loadings in the range of 2 to 30 lb/sq ft. Tests were run over a non-eroding surface, plowed lean clay, river bed gravel, dry sand and a fresh water pond. Mutual interference of the side by side ducts is restricted to a narrow band in the region of the equipotential plane where greater air mass flow and erosion rate result. When operated over eroding surfaces the annular nozzle G. E. M. produces considerable vertical projection of dust and particles while the plenum chamber flow is generally along the surface away from the base area. (Author)

PB 155 234 $10.50

Johns Hopkins U., Baltimore, Md.
THREE-DIMENSIONAL LAMINAR INSTABILITY, by William O. Criminale, Jr. Rept. on Proj. Squid, Contract Nonr-1858(25). Mar 60, 132p. 24 refs. Technical rept. JHU-18-T-R-P: AD-250 108.

DESCRIPTORS: *Laminar boundary layer, Stability, Analysis, Velocity, Propagation, *Turbulent boundary layer, *Turbulence.

Under the restriction of small amplitude so that linear theory is valid, the problem of a localized three-dimensional disturbance in a laminar boundary layer with a Blasius velocity profile is examined. In order to study the growth and diffraction of a spot-like disturbance, the initial disturbance is synthesized from all possible waves whose propagation velocities and amplification rates follow from the classical two-dimensional theory by Squire's generalization. The initial period can be solved explicitly revealing that the principal effect is to reduce the amplitude and spread the disturbance over a wide area. The asymptotic behavior is also predicted indicating the ultimate fate of the disturbance and shows that the maximum rate of growth varies as (e to the power t/t). The gradual approach to the two-dimensional Tollmien-Schlichting wave train is seen as the wave packet spreads laterally as t to the power 1/2. For values of time between initial and final periods, exact numerical results were obtained by the use of an IBM 709 electronic computer. The vorticity due to the disturbance velocity has only two components, one in the mean flow direction, and the lateral direction. (Author)

PB 157 732 $2.60

Princeton U., N. J.
ON THE MACH NUMBER INDEPENDENCE PRINCIPLE FOR A HYPERSONIC BOUNDARY LAYER, by N. C. Freeman and S. H. Lam. Rept. on Contract AF 49(638)465. July 59, 22p. 3 refs. Rept. no. 471; AFOSR-TN-59-728; AD-233 046.

DESCRIPTORS: *Gas flow, *Mach number, *Boundary layer, Hypersonics, Sheets, Mathematical analysis.

The Mach number independence principle for a hypersonic viscous boundary layer postulated by Hayes and Probstein (IAS report no. 59-63, 1959) is considered for the case of a flat plate with no heat transfer. The structure of the boundary layer is given and the transition solution in the neighborhood of the edge of the boundary layer is constructed. This transition layer, in which the boundary layer adjusts to the free stream conditions, is shown to have a thickness scale proportional to $(M_\infty)^{-1-S}$ as originally suggested. The values of density, temperature and velocity across this layer are determined explicitly in terms of velocity and implicitly as functions of boundary layer coordinates. (Author)

SCTM-146-61(13) $9.10

Sandia Corp., Albuquerque, N. Mex.
PRELIMINARY INVESTIGATION OF THE INTERACTION OF AN OBLIQUE SHOCK WAVE AND A TURBULENT BOUNDARY LAYER, by J. K. Cole, V. J. Skogland, and A. A. Trujillo. May 61, 110p.

PB 156 822 $2.60

Stanford Research Inst., Menlo Park, Calif.
THE INTERACTION OF ATOMS WITH SOLID SURFACES, by Bernard J. Wood and Henry Wise. Rept. on Proj. Squid, Contract Nonr-1858(25). Aug 60, 22p. 12 refs. Technical rept. SRI-8-P; AD-244 950.

DESCRIPTORS: Atoms, Solids, Surfaces, *Recombination reactions, *Gas diffusion, *Superaerodynamics, Gases.

The catalytic activities of various solids for recombination of hydrogen, nitrogen, and oxygen atoms were measured. Surfaces examined include titanium, nickel, copper, aluminum, palladium, gold, tungsten, and platinum. In all cases the recombination coefficients were evaluated as a function of surface temperature in a range compatible with the physical properties of the metal. Experimentally, the catalytic activity of a solid for atom recombination is determined under steady-state conditions in a cylindrical tube, with the atom source (a gas discharge) at one end and a movable probe consisting of a wire helix of the active material at the other end. A theoretical analysis of this system yields a dimensionless parameter δ (the diffusion Reynolds number) which allows evaluation of the surface recombination coefficient from atom concentration measurements at the probe at various points in the tube. The experimental technique and theoretical analysis are valid in the viscous-flow regime where the diffusion equation applies. The measurements may be used to explore the transition from viscous to free-molecule flow by decreasing experimental parameters such as pressure and tube radius. Preliminary experiments in the transition region are reported. By using surfaces of known recombination efficiency the technique and analysis may be employed to measure experimentally the diffusion coefficients of atoms through nonuniform gases. (Author)

PB 154 822 $4.60

Watertown Arsenal Labs., Mass.
BUCKLING OF THIN CONICAL SHELLS UNDER UNIFORM EXTERNAL PRESSURE, by John F. Mescall. Feb 61, 41p. 10 refs. Technical rept. no. WAL TR 836.32/3; AD-254 653.

DESCRIPTORS: *Conical bodies, Buckling, Stability, Stresses, *Structural shells, Mathematical analysis, Differential equations, Deformation, Pressure, Elasticity.

The stability of thin circular conical shells under uniform external pressure is investigated by means of an energy procedure. Appropriate strain displacement relations are formulated, paying particular attention to the influence of rotation effects. Higher ordered terms are retained in the strain energy expressions and a buckling criterion is established on the basis of the vanishing of the second variation of the total energy functional. Numerical estimates of the critical pressure were made for a wide range of shell geometries by employing a Rayleigh-Ritz procedure. (Author)

METALLURGY

NAA-SR-M-5933 $1.60

Atomics International, Canoga Park, Calif.
BERYLLIUM AND ZIRCONIUM ALLOYS FOR GBSR COOLANT TUBE APPLICATION, by R. A. Harlow and B. K. Wagner. 1 Dec 60, 16p.

NAA-SR-M-5952 $1.60

Atomics International, Canoga Park, Calif.
AN EVALUATION OF THE COMPATIBILITY OF SOME OF THE SNAP 2 CORE MATERIALS, by L. B. Lundberg. 9 Dec 60, 15p.

NAA-SR-M-5921 $1.10

Atomics International, Canoga Park, Calif.
HIGH TEMPERATURE REACTION KINETICS OF THE U-Zr-C-SYSTEM, by P. E. Elkins and B. A. Webb. 1 Dec 60, 12p.

NAA-SR-M-5869 $1.10

Atomics International, Canoga Park, Calif.
PYROMETALLURGICAL SEPARATION OF THROIUM FROM Th-Al ALLOYS, by D. O. Raleigh. 14 Nov 60, 8p.

BMI-X-169 $1.60

Battelle Memorial Inst., Columbus, Ohio.
ZIRCALOY-STAINLESS STEEL BONDING PROGRAM, by S. W. Porembka. Quarterly rept. no. 2, Mar-June 61. 31 May 61, 13p.

GAMD-1037 $1.60

General Atomic, San Diego, Calif.
POSSIBLE METALLIC MATERIALS FOR MGCR APPLICATION, by Paul D. Wright. Rept. on Contract AT(04-3)-187. 19 Oct 59, 11p.

APEX-475 (Del.) $9.60

General Electric Co., Cincinnati, Ohio.
CHEMISTRY AND METALLURGY OF YTTRIUM, by C. R. Simmons, C. B. Magee and others. Report on Contracts AT(11-1)-171 and AF 33(600)38062. Aug 58, declassified. 113p.

HW-67677 $1.00 Met. & Cer.

Hanford Atomic Products Operation, Richland, Wash.
THE PHYSICAL INTEGRITY AND CORROSION RESISTANCE OF THE ZIRCALOY-2 PRESSURE TUBES FOR THE PRTR, by R. L. Knecht. Rept on Contract AT(45-1)-1350. Dec 60, 37p

KAPL-M-MAG-5 $3.60

Knolls Atomic Power Lab., Schenectady, N. Y.
EVALUATION OF CHROME COATINGS, ELECTRO-DEPOSITED ON INCONEL, by M. A. Gerardi. Rept. on Contract W-31-109-eng-52. 3 May 61, 40p.

TID-12861 $1.10

Knolls Atomic Power Lab., Schenectady, N. Y.
MERCURY PYCNOMETER FOR PARTICLE DENSITIES, by A. T. Muccigrosso, J. R. Fascia and others. Rept. on Contract W-31-109-eng-52. Apr 61, 7p.

KAPL-M-EJC-6 $3.60

Knolls Atomic Power Lab., Schenectady, N. Y.
A STATISTICAL STUDY OF ZIRCALOY-2 WATER AND STEAM AUTOCLAVE CORROSION TESTS, by E. J. Callahan and M. A. Powers. Rept. on Contract W-31-109-eng-52. 15 Mar 61, 33p.

NMI-7209 $4.60

Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF THE DEMONSTRATION SET OF ZIRCALOY-4-CLAD UNALLOYED URANIUM OUTER TUBES NOS. 108-112, EXTRUSION NOS. 29778 TO 29782, by H. F. Sawyer and E. F. Jordan. Rept. on Contract AT(30-1)-1565. 2 May 61, 49p.

NMI-7208 $3.60

Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF THE PROTOTYPE SET OF ZIRCALOY-4-CLAD UNALLOYED URANIUM OUTER TUBES NOS. 95 AND 97, EXTRUSIONS NOS. 28965 AND 28967, by H. F. Sawyer and E. F. Jordan. Rept. on Contract AT(30-1)-1565. 24 Apr 61, 35p.

NMI-7200 $3.60

Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF ZIRCALOY-CLAD UNALLOYED URANIUM TUBES MADE FOR IRRADIATION IN THE VBWR TEST LOOP, by W. L. Larson. Rept. on Contract AT(30-1)-1565. 25 Apr 60, 38p.

NMI-7207 $3.60

Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF ZIRCALOY-4-CLAD UNALLOYED URANIUM INNER TUBE NO. 105 MADE FOR FLOW TESTING AT SRP, by W. L. Larson. Rept. on Contract AT(30-1)-1565. 2 Dec 60, 33p.

NMI-7203 $3.60

Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF ZIRCALOY-4-CLAD UNALLOYED URANIUM OUTER TUBE NO. 75, EXTRUSION NO. 27943, MADE FOR IRRADIATION AT SAVANNAH RIVER, by H. F. Sawyer. Rept. on Contract AT(30-1)-1565. 14 Dec 60, 36p.

Ferrous Metals

PB 155 005 $2.60

Watertown Arsenal Labs., Mass.
ADVANTAGES OF TEMPERING H13 HOT-WORK DIE STEEL BELOW THE SECONDARY HARDENING PEAK, by S. V. Arnold. Rept. on Materials for High Temperature Use. Mar 61, 28p. WAL TR 315.23/1; AD-253 948.

DESCRIPTORS: *Steel, Dies, *Heat treatment, Austenite, Hardening, Processing, Mechanical properties, Tensile properties, Hardness, Phase transitions, X-ray diffraction analysis.

Effects of various austenitizing practices and tempering practices upon strength/toughness behavior of an H13

hot-work die steel have been studied. Superior toughness was realized by recourse to the highest austenitizing temperature investigated, 1950 F. Tempering at temperatures below the secondary hardening peak resulted in better ductility and toughness than were realized at equivalent yield strength levels achieved by tempering above this peak. Maximum sustained notch strength of 315,000 psi for 150 hours duration in the presence of a sharp notch was realized by tempering at 600 F, corresponding to a yield strength of 220,000 psi at 0.2% offset. There was no evidence that 10% retained austenite, which remained after tempering at 600 - 800 F, detracted from the notch toughness of this steel in either dynamic or sustained loading. Ability to sustain loads in the presence of a sharp notch did not correlate with notched tensile strength, impact transition behavior, or percent retained austenite. (Author)

PB 153 984 $1.60

Watertown Arsenal Labs., Mass.
RECRYSTALLIZATION OF IRON AS A FUNCTION OF BINARY SOLUTE ADDITIONS AND TIME, by Ernest P. Abrahamson, II. Technical rept. on Materials for High Temperature Use. Jan 61, 19p. 3 refs. Technical rept. no. WAL TR 830.3/2; AD-251 211.

DESCRIPTORS: *Iron, Crystallization, Time, Additives, Phase studies, Iron alloys, Heat resistant alloys, Temperature.

A study was made of the effect of time and selected binary transition element additions on the recrystallization of iron. The change in recrystallization temperature is a linear function of solute concentration at low solute concentrations. The slope of this function is constant regardless of the time of recrystallization anneal. The limit of the linear initial change in the low solute concentrations is shown to be a function of the ground state electron configuration of the solute. The limit is moved slightly toward lower solute content with increasing time. An Arrhenius plot of the data indicates that the activation energy for onset of recrystallization of each alloy system is a linear function of the atomic percent solute. There is a direct correlation between the logarithm of the rate of change of activation energy with atomic percent solute and the ground state outer electron configuration of the solute. (Author)

Nonferrous (except light) Metals

BMI-1532 $0.75

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF DILUTE-PLUTONIUM ALLOYS, by Victor W. Storhok, Arthur A. Bauer, and Ronald F. Dickerson. Rept. on Contract W-7405-eng-92. July 61, 25p.

LAMS-2496 $1.25

Los Alamos Scientific Lab., N. Mex.
METALLURGICAL EVALUATION OF TANTALUM ALLOYS. PART I. TANTALUM CONTAINING 0.1 OR 3.0 w/o TUNGSTEN, by R. W. Keil, G. S. Hanks, and R. L. Batista. Rept. on Contract W-7405-eng-36. Aug 61, 51p.

Structural Metallurgy and Corrosion

ACNP-6009 $2.50

Allis-Chalmers Co., Milwaukee, Wis.
INVESTIGATION OF THE CORROSION ASPECTS OF SELECTED ALUMINUM ALLOYS, by Karlis Riskevics. Final rept. on Contract AT(11-1)-589. Jan 61, 140p.

NAA-SR-5926 $1.00

Atomics International, Canoga Park, Calif.
MOLTEN PHOSPHATE REACTOR FUELS, II. CORROSION OF METALS IN MOLTEN SODIUM POLYPHOSPHATE, by M. A. Hiller, T. L. Young, and others. Rept. on Contract AT(11-1)-GEN-8. Aug 61, 36p.

NAA-SR-5928 $0.50

Atomics International, Canoga Park, Calif.
MOLTEN PHOSPHATE REACTOR FUELS, IV. IN SITU CORROSION STUDIES OF METALS IN MOLTEN SODIUM POLYPHOSPHATE, by L. F. Grantham, T. L. Young and others. Rept. on Contract AT(11-1)-GEN-8. Aug 61, 19p.

TID-12831 $1.10

Denver Research Inst., Colo.
STUDY OF FACTORS INFLUENCING DUCTILITY OF IRON-ALUMINUM ALLOYS, by George P. Rauscher, Jr. and Joseph F. Nachman. Monthly letter rept. no. 12, 1 May 60-30 Apr 61, on Contract AT(11-1)-742. 12 May 61, 7p.

HW-SA-2179 $3.60

Hanford Atomic Products Operation, Richland, Wash.
NONDESTRUCTIVE TESTING OF ZIRCALOY REACTOR PROCESS TUBES FOR HIGH PRESSURE, HIGH TEMPERATURE SERVICE, by Richard B. Socky. 11 May 61, 33p.

PB 153 982 $2.60

Watertown Arsenal Labs., Mass.
ULTRASONIC DETECTION OF CHANGES IN THE ELASTIC PROPERTIES OF A 70-30 IRON-NICKEL ALLOY UPON HEAT TREATMENT, by Emmanuel P. Papadakis and Everett L. Reed. Rept. on Materials for High Temperature Use. Jan 61, 27p. 22 refs. Technical rept. no. WAL TR 143/36; AD-251 525.

DESCRIPTORS: *Iron alloys, *Nickel alloys, *Ultrasonics, Elasticity, Attenuation, Velocity, Measurements, Phase transitions, Austenite, Martensite, Heat treatment, Transformations.

Ultrasonic attenuation and velocity measurements were made by the pulse method on 30Ni-70Fe alloy specimens after various steps in their transformation from austenite to martensite. It was found that the attenuation from Rayleigh scattering decreased while that from

elastic hysteresis increased as the transformation proceeded. It was concluded that the presence of the small martensite platelets in the grains reduced the anisotropy of the elastic constants of the grains, thus reducing the Rayleigh scattering. The increase in the elastic hysteresis parallels the increase in residual strain and the increase in grain boundary area attending the transformation. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

NYO-2579 $2.60

Aeroprojects Inc., West Chester, Pa.
APPLICATIONS OF ULTRASONIC ENERGY. TASK 1: ULTRASONIC CHEMICAL PROCESSING. TASK 2: ULTRASONIC METAL AND CERAMIC POWDER PROCESSING. Progress rept. no. 23, 1 Aug-30 Aug 60, on Contract AT(30-1)-1836. Oct 60, 21p.

NYO-2582 $3.60

Aeroprojects Inc., West Chester, Pa.
APPLICATIONS OF ULTRASONIC ENERGY. TASK 1: ULTRASONIC CHEMICAL PROCESSING. TASK 2: ULTRASONIC METAL AND CERAMIC POWDER PROCESSING. TASK 3: ULTRASONIC INSTRUMENTATION. Progress rept. no. 25, 1 Dec 60-31 Jan 61, on Contract AT(30-1)-1836. Feb 61, 33p.

NYO-2579, (suppl.)

Aeroprojects Inc., West Chester, Pa.
[APPLICATIONS OF ULTRASONIC ENERGY]. TASK 3: ULTRASONIC INSTRUMENTATION. Progress rept. no. 23, suppl. on Contract AT(30-1)-1836. [1960] 8p.

PB 157 951 $5.60

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE TRANSMISSION OF FAST NEUTRONS THROUGH IRON, ALUMINUM AND LEAD, by Melvin Joseph Bina. Master's thesis. Mar 60, 53p. 11 refs. GNE-60-1; AD-236 498.

DESCRIPTORS: *Fast neutrons, Transmission, Iron, Aluminum, Lead, Dose rate, Statistical analysis, *Elastic scattering, *Inelastic scattering, Errors.

The dose transmission of polonium-beryllium neutrons through iron, aluminum and lead was investigated. A Hurst type, tissue equivalent, neutron detector was used in conjunction with an electronic integrator circuit which gave directly a number proportional to neutron dose rate. It was experimentally determined that the transmission number was a function of source-detector distance and a method was developed whereby the transmission number could be obtained for an effective infinite source-detector separation. The absorbing material consisted of concentric hemispherical shells 15/16 in. thick and three configurations were possible; the spherical absorber, the hemispherical absorber, and the hemispherical reflector. Five shells were used for each configuration with a total resulting thickness of 4 11/16 in. The dose transmission through iron, aluminum, and lead was found to be an exponential function of thickness for the hemispherical absorber configuration and, from this data, relaxation lengths were calculated to be 14.5 cm for iron, 23.6 cm for aluminum, and 20.6 cm for lead. Data was taken for aluminum in the hemispherical reflector and spherical absorber configurations. The results show that approximately four in. of aluminum constitute an infinite reflector for fast neutrons and as a consequence, the relaxation length for the aluminum spherical absorber changes to that of the hemispherical absorber for thicknesses greater than four in. (Author)

PB 157 724 $14.00

AMF Atomics, Inc., Greenwich, Conn.
AIR TRANSPORTATION OF RADIOACTIVE MATERIALS: INITIAL INVESTIGATION, by A. Poindexter. Final engineering rept. 3 Mar-3 Oct 59, on Contract AF 30(602)2007. Oct 59, 210p. 37 refs. ER no. 7558; RADC-TR-59-198; AD-229 854.

DESCRIPTORS: *Power reactors, Reactor fuels, Reactor cores, Radioactive waste disposal, *Air transportation, Costs, *Radioactive isotopes, Radiation hazards, *Logistics.

A study is reported of the logistics, economics and safety aspects of air transportation of radioactive materials arising from the use of small nuclear power reactors and radio-isotope energy sources. The principal radioactive materials which may be shipped in connection with the operation of small nuclear power plants are: spent reactor fuel, radioactive wastes, small radioactive components of the plant, and fresh reactor fuel. These materials are listed in decreasing order of cost and logistic effort required for shipment. All of these materials can be shipped on a C-130 airplane with little special equipment other than shielded shipping casks. One airplane can service five small reactors similar to the SM-1 in the three month winter period during which airstrips in remote Arctic bases are operational. Shipments of these materials can be made without creating a serious radioactive hazard to the health of the public even in the event of a serious accident. Optimized shipping plans are given for the SM-1 and SL-1 reactors in remote Arctic locations. A program for putting these shipping plans in action is outlined. (Author)

ANL-6333 $3.50

Argonne National Lab., Ill.
CHEMICAL ENGINEERING DIVISION SUMMARY REPORT, JANUARY-MARCH, 1961. Rept. on Contract W-31-109-eng-38. June 61, 250p.

BNL-5390 $2.60

Brookhaven National Lab., Upton, N. Y.
100 MEGACYCLE COUNTING SYSTEM, by R. Sugarman, W. A. Higinbotham, and others. 12 June 61, 25p.

NAA-SR-M-6228 $1.60

Atomics International, Canoga Park, Calif.
RADIATION EFFECTS ON DISPERSION FUEL ELEMENTS; A SELECTED BIBLIOGRAPHY, by M. Bloomfield. 23 Mar 61, 15p.

BNL-5497 $1.10

Brookhaven National Lab., Upton, N. Y.
EXTRACTION AND FOCUSING OF BEAM III, by G. Chadwick. 16 Dec 60, 4p.

BNL-664(T-218) $0.75

Brookhaven National Lab., Upton, N. Y.
NEUTRON PHYSICS OF AND WITH THE HIGH FLUX BEAM RESEARCH REACTOR, by Herbert J. C. Kouts. Mar 61, 27p.

ORO-417 $1.60

Clevite Corp., Cleveland, Ohio.
FUEL-BEARING FIBERGLAS IN ALUMINUM-BASE FUEL ELEMENTS, by R. H. Baskey. Quarterly rept. no. 6, 1 Jan-31 Mar 61 on Contract AT(40-1)-2557. 3 May 61, 17p.

NYO-9142 $1.60

Consolidation Coal Co., Library, Pa.
UTILIZATION OF RADIOACTIVE ISOTOPES IN COAL PROCESS RESEARCH, by P. M. Yavorsky and E. Gorin. Quarterly technical status rept. no. 8, 1 Feb-30 Apr 61, on Contract AT(30-1)-2350, Task II. 1 May 61, 19p.

HW-68494 $0.50

Hanford Atomic Products Operation, Richland, Wash.
THE EFFECT OF IRRADIATION ON SILICONIZED-SILICON CARBIDE COATINGS FOR GRAPHITE, by J. L. Jackson. Rept. on Contract AT(45-1)-1350. Feb 61, 12p.

HW-69475 $1.75

Hanford Atomic Products Operation, Richland, Wash.
PHYSICS RESEARCH. Quarterly rept. Jan-Mar 61, on Contract AT(45-1)-1350. April 61, 65p.

UCRL-9652 $3.00

Lawrence Radiation Lab., U. of California, Berkeley.
BIO-ORGANIC CHEMISTRY. Quarterly rept. Dec 60-Feb 61 on Contract W-7405-eng-48. Apr 61, 225p.

MCW-1467 $2.25

Mallinckrodt Chemical Works, Weldon Spring, Mo.
ALPHA PHASE VACUUM OUTGASSING OF DINGOT URANIUM, by J. A. Fellows. Topical rept. on Contract W-14-108-eng-8. Aug 61, 117p.

MND-P-3014-II $2.10

Martin Co., Baltimore, Md.
SNAP PROGRAMS. Task 5: Thermionic Isotopic Power Systems. Quarterly Progress Report No. 6, 1 Jan-31 Mar 61, on Contract AT(30-3)-217. [1960] 101p.

CF-61-5-118 $3.60

Oak Ridge National Lab., Tenn.
DETERMINATION OF TRACE ELEMENTS IN WATER BY NEUTRON RADIOACTIVATION ANALYSIS, by G. W. Leddicotte and D. W. Moeller. 29 May 61, 32p.

CF-60-6-30 $1.10

Oak Ridge National Lab., Tenn.
EUROCHEMIC ASSISTANCE PROGRAM: COMMENTS BY ICPP ON QUESTIONS FROM EUROCHEMIC, by E. M. Shank. 13 June 60, 4p.

NAS-NS-3038 $0.50

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF TELLURIUM, by G. W. Leddicotte. July 61, 46p.

NYO-9403 $2.60

Radio Corp. of America, Harrison, N. J.
NUCLEAR TRACK IMAGE INTENSIFIER, by R. D. DesRochers, H. A. Stern, and L. A. Ezard. Quarterly rept. no. 3, 1 Dec 60-28 Feb 61, on Contract AT(30-1)-2591. 30 Mar 61, 28p.

NYO-9688 $1.60

Rochester U., N. Y.
THE INFLUENCE OF ISOTOPIC COMPOSITION ON THE MAXIMUM IN THE COSMIC RAY ENERGY SPECTRA, by M. V. K. Appa Rao and M. F. Kaplon. Rept. on Contract AT(30-1)-875. 8 May 61, 11p.

Elementary Particles

NYO-9579 $8.10

Aeroprojects Inc., West Chester, Pa.
ULTRASONIC COALESCENCE IN GASEOUS SYSTEMS, by William B. Tarpley and C. D. McKinney, Jr. Rept. on Contract AT(30-1)-1836. Apr 61, 90p.

ARF-3187-4 $1.60

Armour Research Foundation, Chicago, Ill.
ELECTROSTATIC CLASSIFICATION OF SUBMICRON AIRBORNE PARTICLES, by G. Langer. Progress rept. for 15 Apr-15 June 61 on Contract AT(11-1)-578. [1961] 17p.

NAA-SR-6104 $1.00

Atomics International, Canoga Park, Calif.
THE FOG ONE-DIMENSIONAL NEUTRON DIFFUSION EQUATION CODES, by H. P. Flatt. Rept. on Contract AT(11-1)-GEN-8. Aug 61, 46p.

WAPD-TM-284 $0.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
GRAPHS OF COEFFICIENTS FOR DETERMINING MULTIGROUP P-1 CONSTANTS FROM DIFFERENTIAL SCATTERING CROSS SECTIONS, by H. J. Amster and C. B. Noll. Rept. on Contract AT(11-1)-GEN-14. July 61, 8p.

UCRL-9712 $1.75

Lawrence Radiation Lab., U. of California, Berkeley.
AN EXPERIMENTAL DETERMINATION OF THE K_1^o - K_2^o MASS DIFFERENCE. by Robert P. Matsen. Rept. on Contract W-7405-eng-48. May 61, 70p.

UCRL-6443 $1.00

Lawrence Radiation Lab., U. of California, Livermore.
MEASUREMENT OF THE POLARIZATION OF PHOTONEUTRONS FROM DEUTERIUM, by Frederick V. Martin and Walter John, Jr. Rept. on Contract W-7405-eng-48. May 61, 40p.

UCRL-9734 $1.50

Lawrence Radiation Lab., U. of California, Berkeley.
PRODUCTION OF PION PAIRS BY A PHOTON IN THE COULOMB FIELD OF A NUCLEUS, by Yongduk Kim. Rept. on Contract W-7405-eng-48. June 61, 60p.

LA-2560 $2.00

Los Alamos Scientific Lab., N. Mex.
MULTIPLE SCATTERING CORRECTIONS TO THE NUCLEAR OPTICAL POTENTIAL, by Robert R. Johnston. Rept. on Contract W-7405-eng-36. Aug 61, 89p.

IDO-16657 $2.00

Phillips Petroleum Co., Idaho Falls.
MTR THERMAL NEUTRON FLUX MEASUREMENTS FOR CYCLE 146, by L. D. Weber and C. H. Hogg. Rept. on Contract AT(10-1)-205. May 61, 93p.

Instruments and Installations

NAA-SR-5608 $4.00

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DESCRIPTORS: *Nuclear reactions, Deuterons, *Accelerators, *Deuteron reactions, Protons, *Proton reactions, Nuclei, Energy, Tables.

The emitted proton energy and magnetic rigidity are presented as a function of incident deuteron energy for the ground state d-p reaction on the light elements through neon. The deuteron energy range of 1.1 to 2.1 Mev is covered in 10 kev increments at laboratory reaction angles of 30, 60, 90 and 120 degrees. (Author)

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BNL-5531 $1.60

Brookhaven National Lab., Upton, L. I., N. Y.
PHASE-SPACE MATCHING OF LONGITUDINAL (PHASE) OSCILLATIONS USING THE INJECTOR AS THE MATCHING SYSTEM, by Lee C. Teng. LCT-3. 10 Apr 61, 11p.

HW-68389 $2.00

Hanford Atomic Products Operation, Richland, Wash.
PHYSICS RESEARCH QUARTERLY REPORT, OCTOBER, NOVEMBER, DECEMBER, 1960, by F. G. Dawson, Jr., J. L. Carter, and others. Rept. on Contract AT(45-1)-1350. 20 Jan 61, 75p.

NYO-9118 $0.50

Jarrell-Ash Co., Newtonville, Mass.
A FEASIBILITY STUDY FOR THE USE OF AN EXTENDED Pm^{147} SOURCE FOR ANALYTICAL FLUORESCENCE SPECTROSCOPY, by Frederick Brech. Final rept. on Contract AT(30-1)-2491. Oct 60, 29p.

KAPL-M-RJR-4 $4.60

Knolls Atomic Power Lab., Schenectady, N. Y.
A COMPARISON OF EXPERIMENTS AND THREE-DIMENSIONAL ANALYSIS TECHNIQUES. PART II. UNPOISONED UNIFORM SLAB CORE WITH A PARTIALLY INSERTED HAFNIUM ROD AND A PARTIALLY INSERTED WATER GAP, by R. J. Roseberry. Rept. on Contract W-31-109-eng-52. 17 Apr 61, 41p.

TID-12834 $7.60

Laboratory for Nuclear Science, Mass Inst. of Tech., Cambridge; Research Lab. of Electronics, Inst. of Tech., Cambridge; and Bell Telephone Labs., Murray Hill, N. J.
CONFIGURATION MIXING AND THE EFFECTS OF DISTRIBUTED NUCLEAR MAGNETIZATION ON HFS IN ODD A NUCLEI, by H. H. Stroke, and R. J. Blin-Stoyle, and V. Jaccarino. Rept. on Contract AT(30-1)-2098. [1960] 79p.

AD-258 612 $4.60

National Research Labs., Ottawa (Canada).
A FREQUENCY MODULATION CIRCUIT FOR THE MEASUREMENT OF GAS CONDUCTIVITY AND BOUNDARY LAYER THICKNESS IN A SHOCK TUBE, by P. Savic and G. T. Boult. May 61, 49p. 19 refs. NRC no. 6349; Mechanical Engineering rept. MT-43.

DESCRIPTORS: *Plasma physics, *Shock tubes, Gas flow, *Gases, *Conductivity, Measurement, Coils, Magnet coils, Inductance, Oscillograms, Instrumentation, *Frequency modulation, *Boundary layer, Thickness, Ionization, Canada.

The change in inductance of a short coil due to the presence around its axis of a cylindrical, moving, electrically conducting fluid is calculated and it is shown that, under certain conditions, the hydromagnetic influence can be kept small. Based on these calculations, a frequency modulation circuit has been designed and calibrated, which enables the measurement of conductivities of gases behind strong shocks in shock tubes to be measured with fair accuracy and adequate time resolution for the detection of local variations in flow structure. Simultaneous recording of shock streaks and conductivity oscillograms indicate that precursor signals are not detectable with this method. (Author)

PB 154 500 $7.60

Radiation Lab., U. of Michigan, Ann Arbor.
PHOTON TRANSPORT THEORY, by R. K. Osborn and E. H. Klevans. Rept. on Contract DA 36-039-sc-75041. Aug 60, 78p. 30 refs. 2764-5-T; ARPA Order no. 120-60; AD-246 895.

DESCRIPTORS: *Photons, *Transport properties, Scattering, Absorption, Perturbation theory, Theory, Plasma physics.

A first order, momentum - configuration space transport equation for photons is derived for low energy (non-relativistic) systems. The derivation is first order in the sense that the transition probabilities characterizing photon scattering emission and absorption are computed only to the first non-vanishing order by conventional perturbation methods. The approach provides an essentially axiom-deduction development of the theory of radiative transfer (albeit via several ill-evaluated approximations) within the context of which various processes and their interrelationships may be investigated. Most of these processes were hitherto studied only phenomenologically and usually piecemeal. Specific application to photon scattering, cyclotron radiation, recombination radiation, de-excitation radiation, and bremsstrahlung is made. The derivation of an H-theorem for photon-particle systems is sketched; and contact is made with the usual statistical mechanical treatment of the equilibrium states of such systems. Some aspects of collective particle behavior can be introduced quite naturally into the description of photon transport in the fully ionized plasma. (Author)

DP-597 $0.75

Savannah River Lab., Aiken, S. C.
IBM 650 ROUTINE VII PRESSURE DROP IN CHANNELS WITH BOILING, by J. C. Jensen. Rept. on Contract AT(07-2)-1. June 61, 27p.

Acoustics

PB 155 315 $1.60

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
NEAR FIELD SOUND PRESSURE OF ARRAYS OF PISTONS, by Charles H. Sherman and Donald F. Kass. 20 Feb 61, 20p. 6 refs. USL rept. no. 495; AD-252 964.

DESCRIPTORS: *Underwater sound, *Sonar, *Sonar signals, *Acoustics, Acoustic horns, Wave analysis, Wave characteristics, Sound, Vibration mechanisms, Pistons, Pressure, Disks.

The sound pressure on the plane due to a circular piston in an infinite, rigid plane is calculated for values of ka from 0.7 to 2.0. The pressures due to single pistons are then superimposed to obtain the total sound pressure on the surface of line arrays and square arrays of pistons. The distributions of near field sound pressure amplitude are in general quite non-uniform, and the spatial pressure variations increase strongly when the beam is steered electrically. The pressure distributions for arrays of half wavelength and quarter wavelength pistons are compared in detail, and it is found that the distribution is somewhat more uniform when a given array size is filled with the smaller pistons. The relationship of the results to other near field results, including radiation impedance, is illustrated. (Author)

PB 154 257 $8.10

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
THEORY OF THE PIEZOELECTRIC FLEXURAL DISC TRANSDUCER WITH APPLICATIONS TO UNDERWATER SOUND, by Ralph S. Woollett. 5 Dec 60, 88p. 24 refs. USL Research rept. no. 490; AD-249 731.

DESCRIPTORS: *Piezoelectric transducers, *Piezoelectric materials, Design, Electrical properties, Mechanical properties, Barium compounds, Lead compounds, Titanates, Zirconates, *Underwater sound.

Derivations of the equations needed for the engineering treatment of the flexural disk transducer are presented. The clamped-edge disk as ordinarily constructed is found to have zero electromechanical coupling, but if the electrodes are divided at the circle where the piezoelectric charge changes polarity, a coupling coefficient of .61K can be achieved, where K is the planar coupling coefficient of the ceramic. The supported-edge disk has a coupling coefficient of .77K, and the supported-center disk a coupling coefficient of .58K. Trilaminar disks in which the central lamination is of non-piezoelectric material are shown to be capable of a coupling coefficient about 9% higher than the all-ceramic disk in the edge-supported mode. Design principles for the supported-edge disk transducer are discussed in some detail. Numerical results and design graphs are given for transducers made either of barium titanate or of lead titanate zirconate. In sonar applications all performance properties benefit by making the thickness-to-radius ratio of the disk as large as possible. Mechanical Q's below 10 and average surface intensities of about 1 watt/sq cm appear achievable. In practice, the supported-edge condition can be realized fairly well in a design in which two flexural disks are operated as a balanced vibrator with a narrow, radially compliant, spacer ring separating them. (Author)

Electronics

PB 152 308 $16.00

Electron Tube Lab., U. of Michigan, Ann Arbor.
A SMALL-SIGNAL THEORY OF ELECTRON-WAVE INTERACTION IN CROSSED ELECTRIC AND MAGNETIC FIELDS, by George E. Dombrowski. Doctoral thesis. Technical rept. no. 22 on Contract DA 36-039-sc-56714. Oct 57, 245p. 54 refs. 2275-2 8-T; AD-159 861.

DESCRIPTORS: *Traveling wave tubes, Magnetrons, Electron beams, Wave transmission, *Perturbation theory, Electric fields, Magnetic fields, Differential equations, Space charges, *Electromagnetic waves.

A theory is developed for small perturbations of a thin electron stream through crossed electric-and-magnetic fields. The stream is assumed to have the d-c characteristics of rectilinear Brillouin flow, and the theory accounts for the velocity gradient of such a beam and also for the r-f space-charge effects. Waves propagated by the stream-circuit combination describe interaction of both synchronous and "cyclotron" types. Conditions at the ends of the transmission medium formed by the stream and electrode structure are treated as combined electromagnetic and hydrodynamic boundary-value problems characterized by continuity requirements at all points in the cross-sections of entrance and exit. It is shown that a reasonably accurate solution of such a boundary value problem can be obtained with the relatively few waves obtained from the perturbation theory. The important parameters governing the propagation of quasi-synchronous waves are: (a) an interaction parameter, D_i, similar to the gain parameter, C, of traveling-wave tube theory; (b) a stream-thickness parameter, r; (c) the location of the stream relative to the electrodes; and (d) the mean velocity of the stream relative to the circuit phase velocity.

PB 157 822 $4.60

General Electric Co., Syracuse, N. Y.
STUDY OF MULTIPACTOR DISCHARGE CHARACTERISTICS. Technical note no. 1 on Contract AF 39(602)1641. 25 June 59, 47p. 23 refs. RADC-TN-59-307; AD-230 659.

DESCRIPTORS: *Gas discharges, *Secondary emission, Electrons, Motion, Theory, Space charges.

Multipactor discharge in a plane gap is studied with emphasis on finding steady-state conditions and the limitations of discharge strength as dictated by space charge repulsion and secondary emission ratio. The theoretical results are applied to practical gap design, and comparisons with experimental measurements are made. (Author)

Optics

PB 155 044 $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
DYNAMIC BALANCING OF SCANNER DRUM AND GYROSCOPIC EFFECT DURING MANEUVERS AF AIRCRAFT, by W. L. Brown and C. T. Yang. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. Feb 61, 17p. 2900-250-T; AD-251 776.

DESCRIPTORS: *Infrared scanning, Mechanics, *Infrared detectors, Rotating structures, *Cylindrical bodies, Aerial reconnaissance, Stability, Stabilization, Applied mechanics, Geometry, Mathematical analysis, Design.

The report presents the equations for determining the dynamic balancing and gyroscopic effect of a rotating scanner drum assembly of the type used in the Project MICHIGAN wide-angle scanner. The parameters used in the numerical example are those of the wide-angle scanner, and the theoretical calculations of the dynamic balancing agree excellently with the actual mechanical dynamic balancing of the drum assembly. The calculations also indicate that gyroscopic forces in the drum are negligible even during maximum rate of turn and maximum rate of climb of the aircraft carrying the scanner. (Author)

PB 155 045 • $3.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
MECHANICS OF ROTATING PLATES AND PRISMS, by W. L. Brown and C. T. Yang. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. Feb 61, 31p. 3 refs. 2900-25-T; AD-251 777.

DESCRIPTORS: Disks, Ellipsoids, Rotation, Prismatic bodies, *Prisms (Optics), Glass, Bodies of revolution, Rotating structures, Mechanics, Velocity, Quartz, Materials, *Metal plates, Stresses, Deflection, Optics Vibration, *Infrared scanning, Geometry, *Infrared detectors, Theory.

This is the report of an analysis of rotating plates and prisms from a theoretical viewpoint for the purpose of setting limits on the size and rotational speed of such bodies for scanner applications. The analysis was carried completely through for a fused-quartz elliptical plate rotating about an axis, in the plane which contains a normal to the plate and the major axis, at a 45 degree angle to the major axis, and for a fused-quartz prism of triangular cross section rotating about an axis through its centroid, normal to the cross section. The analysis indicated that the stresses and displacements are quite large for a 0-5-inch-thick plate with a 9-inch major axis and a 9 to the -1/2 power inch minor axis, but negligible for a 6-inch prism whose cross section is an equilateral triangle of 3-inch altitude. The foregoing applies for rotational frequencies of approximately 100 cps, which is a typical operating speed for an infrared scanner. (Author)

Solid State Physics

ARF-1184-1 $1.60

Armour Research Foundation, Chicago, Ill.
MAGNETIC PROPERTIES OF INSULATIONS, by Jordan J. Markham. Quarterly rept. no. 1 on Contract AT(11-1)-578. 29 May 61, 13p.

NAA-SR-6003 $1.50

Atomics International, Canoga Park, Calif.
THE CLOSEST PACKING OF SPHERES (A UNIFYING BASIS FOR CRYSTAL STRUCTURES), by William G. Gehman. Rept. on Contract AT(11-1)-GEN-8. July 61, 74p.

BNL-5391 $3.60

Brookhaven National Lab., Upton, N. Y., and Bell Telephone Labs., Murray Hill, N. J.
CHARGE COLLECTION IN SEMICONDUCTOR PARTICLE DETECTORS, by G. L. Miller and W. M. Gibson. 12 June 61, 35p.

PB 152 084 $8.10

Clevite Research Center, Cleveland, Ohio.
STUDY OF METHODS FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Danforth R. Hale and Frank Augustine. Final rept. 15 Jan 56-15 Sep 58, on Contract DA 36-039-sc-72415. 15 Oct 58, 88p. 27 refs. AD-209 447.

DESCRIPTORS: *Quartz crystals, Growth, X-rays, Aluminum, Germanium, Absorption, Radiation effects, Crystals.

X-irradiation darkening of quartz was studied from the viewpoint of defect structure. The intensity and the wave-length of the peaks is considerably influenced by choice of seed, nutrient material, and composition of solution. The optical absorption spectra of X-irradiated Z-, plus-X- and minus-X-, and minor-r-growth quartz produced in the normal or usual process, are compared with the optical absorption of the same types grown in the presence of aluminum as impurity and again of germanium as impurity. The optical absorption of a specimen of natural quartz is compared with that of a similar specimen "swept" of mobile impurities by heating in an electric field (a Bell Telephone Laboratories experiment). Striations and other forms of nonuniform coloration in X-irradiated synthetic quartz were studied. Surface irregularities and etch patterns of polished and natural surfaces were studied. Spiral growth patterns of rounded triangular shape were observed on the basal (0001) plane of synthetic Y-bars. The cause of fissure flawing of quartz grown in small autoclaves was studied. (See also PB 140 296)

PB 155 183 $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
PHOTOCONDUCTIVITY IN SINGLE-CRYSTAL TELLURIUM, by D. F. Edwards, C. D. Butter, and L. D. McGlauchlin. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. Mar 61, 12p. 15 refs. 2900-248-R; AD-252 671.

DESCRIPTORS: *Tellurium, *Single crystals, Crystals, Growth, *Photoconductivity, Theory, Measurement, *Infrared detectors, Infrared radiation.

Measurements are reported of the photoconductive properties of tellurium crystals grown from the vapor phase as well as from the melt. The results are compared with measurements of other types of photoconductive cells and with theoretical estimates of the cell detectivity. There is evidence that the tellurium photoconductive cell may be constructed to be background-radiation limited. (Author)

PB 156 837 $10.10

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
THE MEASUREMENT OF THE IONIC HALL EFFECT IN SODIUM CHLORIDE, by Philip L. Read and Ernst Katz. Final rept. on Contract Nonr-154(00). Aug 60, 129p. 59 refs. 1912-4-F; AD-247 465.

DESCRIPTORS: *Single crystals, *Sodium compounds, Chlorides, *Ionic current, Measurement, High temperature research, Electric fields, Magnetic fields, *Hall effect.

High temperature ionic Hall effect measurements in large single crystals of pure sodium chloride were undertaken in order to: (1) demonstrate the existence of the ionic Hall effect, and (2) measure the temperature dependence of the Hall mobility of the ionic charge carriers. The ionic Hall effect was never observed in a solid, although an upper limit for the effect in NaCl was set. Also, only two ionic (drift) mobility measurements in NaCl exist, and neither measurement was carried out near the melting point. The desirability of making independent ionic mobility measurements by a more straightforward method than previously used is discussed, and Hall effect measurements are proposed. The usual mobility theory for ionic charge carriers is described and the previous mobility measurements in NaCl are summarized. A theory of the Hall effect in ionic conductors is developed. The results of the ionic Hall effect measurements in NaCl are given. In spite of the presence of a large amount of current noise, measurements were made at seven temperatures in the range 601°-780°C. These results are shown to be in fairly good agreement with previous data, and the approximate equality of the Hall and drift mobilities of the ionic charge carriers in NaCl is demonstrated. (Author)

PB 148 350 $4.60

Plastics Lab., Princeton U., N. J.
SEMI-CONDUCTION IN ALUMINUM-DOPED PYRO-POLYMERS, by H. A. Pohl and J. P. Laherrere. Rept. on Contract DA 36-039-sc-78105. 15 Apr 60, 46p. 42 refs. Technical rept. 57C; AD-238 249.

DESCRIPTORS: *Semiconductors, Aluminum, Ion exchange resins, Pyrolysis, Thermoelectricity, Heat treatment, Electrical conductance, Resistance, Polymers.

This paper describes a study made of the electronic behavior of aluminum-doped pyro-polymers. These materials are semi-conductors of 0.01 to 0.1 ohm-cm resistivity at room temperature, and of p-type. The presence of aluminum decreased the conductivity and increased the resistance-temperature coefficient. The effects are opposite to that of the nickel-doped pyro-polymers described earlier [PB-156 279]. Hall voltage measurements placed the carrier concentration in excess of 4×10^{19} per cc. The absolute thermoelectric power of these materials, doped from 0 to 10 atom %, varied from 2 to 5 microvolts per degree, and increased with temperature in a manner showing the carrier concentration to increase with temperature rise and to be about 2×10^{20} per cc. The evidence to date indicates that the aluminum is present in the form of carbide-like compounds, and not as the element or the oxide. These pyro-polymers were prepared by the pyrolysis of suitably doped ion exchange resin, heat treated at 800, 1000 and 1200°C. (Author)

PB 157 713 $1.60

X-Ray and Crystal [Analysis] Lab., Pennsylvania State U., University Park.
A NEW ROOM-TEMPERATURE FERROELECTRIC, by R. Pepinsky, K. Vedam and Y. Okaya. Rept. on Contracts AF 18(603)35 and DA 36-039-sc-72385. [1958] 12p. 15 refs. AFOSR-TN-58-217; AD-234 954.

DESCRIPTORS: *Ferroelectric crystals, Complex compounds, Glycines, Manganese compounds, Chlorides, Hydrates, Growth, Crystal structure, Electrical properties

The neutral-salt complex with glycine, di-glycine manganous chloride dihydrate, $(NH_2CH_2COOH)_2 \cdot MnCl_2 \cdot 2H_2O$, is found to be ferroelectric from low temperatures to +55°C. Above the latter temperature the conductivity suddenly becomes excessive. At room temperature the spontaneous polarization is 1.3×10^{-6} coulombs/cm^2 and the coercive field is 5.6 kv/cm. A non-reversible surface change is observable optically above 72°C, probably due to loss of H_2O. Thermal measurements indicate onset of water loss above 35°C; electrical conductivity increases sharply and irreversibly above 55°C, and care must be taken to prevent dehydration even at room temperature. No Curie temperature can be observed. X-ray measurements of this hitherto unreported salt show space group $P2_1$, $\underline{a} = 9.96$ Å, $\underline{b} = 8.53$ Å, $\underline{c} = 6.86$ Å, $\beta = 107 \pm 0.5°$, density = 1.875$_0$ g/cc, and two formula units per cell. The ferroelectric axis is along $\underline{b}$. The dielectric constants at room temperature are $\epsilon_a = 6.6$, $\epsilon_b = 8.1$, $\epsilon_c = 7.4$; and these decrease linearly and only very slightly as the temperature is lowered to 77°K. The corresponding neutral-salt complex of two glycines with $MnBr_2$ is not isomorphous, occurring as a tri-hydrate, and is not ferroelectric. It has not been possible to find any metal which will replace manganese and form an isomorphous crystal. (Author)

Theoretical Physics

PB 155 330 $3.60

Columbia U., New York.
INVESTIGATIONS IN THE MATHEMATICAL THEORY OF VIBRATIONS OF ANISOTROPIC BODIES. Final rept. 1 July 56-30 June 60, on Contract DA 36-039-sc-72831. [1960] 39p. 19 refs. CU-17-60-SC-72831-CE; AD-248 589.

DESCRIPTORS: Vibration, *Dynamics, Sheets, *Elasticity, Mathematical analysis, Applied mathematics, Crystals.

On the equations of extensional motion of crystal plates: The low-frequency extensional motions of crystal plates are governed by the Cauchy-Voigt two-dimensional equations. The conditions are found under which the equations may be transformed to a form from which solutions in curvilinear coordinates are obtained readily. The conditions are found to be satisfied by four cuts of quartz. High frequency vibrations of crystal plates: Cauchy's two-dimensional equations of low-frequency, coupled flexural and extensional motion of

crystal plates are extended to the next higher order of approximation so as to accommodate the frequencies of the two lowest thickness-shear modes. Theorems of orthogonality and uniqueness of solutions are established and some general conclusions are drawn regarding solutions in rectangular coordinates and vibrations of rectangular plates.

UCRL-6380 $2.60

Lawrence Radiation Lab., U. of California, Livermore.
CONTAINMENT OF POSITRONS IN AN ASYMMETRIC MIRROR GEOMETRY, by G. Gibson, W. C. Jordan and others. Rept. on Contract W-7405-eng-48. 8 June 61, 14p.

UCRL-6232-T $3.60

Lawrence Radiation Lab., U. of California [Berkeley].
DIAGNOSTIC MEASUREMENTS OF A HIGHLY IONIZED, STEADY-STATE PLASMA, by Andrew L. Gardner. Rept. on Contract W-7405-eng-48. 31p.

UCRL-6390 $3.60

Lawrence Radiation Lab., U. of California, Livermore.
ENERGY BALANCE IN THE ASTRON DEVICE, by Nicholas C. Christofilos. Rept. on Contract W-7405-eng-48. 15 June 61, 39p.

UCRL-6383 $2.60

Lawrence Radiation Lab., U. of California, Livermore.
ENERGY TRANSFER FROM HOT IONS TO COLD ELECTRONS IN A PLASMA, by John Killeen, Warren Heckrotte, and Garret Boer. Rept. on Contract W-7405-eng-48. 12 June 61, 29p.

UCRL-6384 $2.60

Lawrence Radiation Lab., U. of California, Livermore.
THE "MIRROR INSTABILITY" FOR FINITE PARTICLE GYRORADIUS, by Harold P. Furth. Rept. on Contract W-7405-eng-48. [June 61] 22p.

UCRL-6393 $2.60

Lawrence Radiation Lab., U. of California, Livermore.
PLASMA PRODUCTION BY THE TRAPPING OF ENERGETIC ATOMS, by C. C. Damm, A. H. Futch and others. Rept. on Contract W-7405-eng-48. 12 June 61, 21p.

UCRL-6379 $2.60

Lawrence Radiation Lab., U. of California, Livermore.
THE STRUCTURE OF THE ASTRON E-LAYER, by Lewi Tonks. Rept. on Contract W-7405-eng-48. 10 June 61, 24p.

UCRL-6381 $2.60

Lawrence Radiation Lab., U. of California, Livermore
PRODUCTION AND CONTAINMENT OF HOT DEUTERIUM PLASMAS IN MULTISTAGE MAGNETIC COMPRESSION EXPERIMENTS, by F. H. Coensgen, W. F. Cummins and others. June 61, 22p.

PB 155 558 $4.60

Microwave Lab., Stanford U., Calif.
SOME ASPECTS OF MASTER THEORY, by E. T. Jaynes, Rept. on Contract DA 36-039-sc-71178. May 58, 45p. 5 refs. Topical rept. M. L. no. 502; AD-200 359.

DESCRIPTORS: *Infrared radiation, Theory, *Quantum mechanics, *Molecular beams, Excitation, Stability, *Microwave amplifiers, *Microwave oscillators.

As a preliminary to a theoretical study of the ultimate limitations on noise figure and frequency stability in molecular-beam masers, the relation between quantum electrodynamics and the semiclassical theory of radiation is examined. Solutions according to both theories are worked out in detail for the case of a single molecule interacting with a single cavity oscillation mode. Comparison of the results shows several features which make the relation of the two theories appear rather different than is usually supposed. The molecular-beam maser provides an interesting example of the Einstein-Podolsky-Rosen paradox, arising from correlations in states of molecule and field. An attempt is made to find an experimental situation in which effects of such correlations are observable, but without success. It is shown that the semiclassical theory of radiation can account for spontaneous emission of radiation. It leads to a characteristic time just the same as provided by field quantization. When both the effect of the field on the molecule and the effect of the molecule on the field are taken into account the result is a system of coupled nonlinear equations whose solutions can be found in terms of elliptic functions. Even in the case of field intensities corresponding to one photon, this solution reproduces almost quantitatively the same laws of energy exchange as found in quantum electrodynamics. It is concluded that the semiclassical theory, as extended here, is a far more reliable means of calculating radiation processes than usually supposed. (Author)

PB 157 719 $5.60

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
ELECTROMAGNETIC WAVE PROPAGATION IN HIGH TEMPERATURE PLASMAS, by Romayne F. Whitmer. Technical rept. on Contract AF 30(604)1944. 22 Dec 59, 60p. 8 refs. RADC-TR-59-203; AD-231 109.

DESCRIPTORS: High temperature research, *Plasma physics, Electromagnetic waves, Propagation, *Electrons, Magnetic fields, Shock waves, *Cyclotrons, Microwaves, Measurement, *Wave transmission.

The study of electromagnetic wave propagation in high temperature plasmas was divided into two phases: the first phase considered high electron temperature plasmas produced by means of microwave breakdown at electron cyclotron resonance; and the second phase considered high temperature plasmas produced by means of a shock wave. In the first phase, the theory and the experimental programs studied propagation through a uniform plasma in the presence of a dc magnetic field where the effects of a high electron temperature are of importance.

MATT-71 $1.60

Plasma Physics Lab., Princeton U., N. J.
RECOMBINATION IN A HELIUM PLASMA, by R. W. Motley and A. F. Kuckes. Rept. on Contract AT(30-1)-1238. May 61, 18p.

PB 157 730 $2.60

Princeton U., N. J.
SIMPLE VORTICITY LAWS IN MAGNETOHYDRODYNAMICS, by Ching-sheng Wu. Rept. on Contract AF 49(638)465. Nov 58, 25p. 4 refs. Rept. no. 445; AFOSR-TN-58-1044; AD-231 173.

DESCRIPTORS: *Magnetohydrodynamics, *Fluid flow, Equations of state, *Gas flow, Plasma physics.

Some simple vorticity laws in magnetohydrodynamics were derived. The discussions include the generalized Crocco's vorticity law (ZAMM 17:1-7, 1937) and Lighthill's vorticity expression (J. Fluid Mech. 2:1-32, 1957) behind 3-dimensional shock wave. Finally, a generalization of Hayes dynamic derivation of vorticity jump across a gas dynamic discontinuity is obtained. (Author)

Thermodynamics

KAPL-2143 $0.75

Knolls Atomic Power Lab., Schenectady, N. Y.
FUNDAMENTALS OF THERMAL CONDUCTIVITY AT HIGH TEMPERATURES, by A. E. Powers. Rept. on Contract W-31-109-eng-52. Apr 61, 27p.

UCRL-6424 $2.50

Lawrence Radiation Lab., U. of California, Livermore.
HIGH TEMPERATURE MEASUREMENT AND PRODUCTION, by James H. Kennedy, Carl J. Wensrich and others. A bibliography. Rept. on Contract W-7405-eng-48. July 61, 117p.

CF-61-5-80 $2.60

Oak Ridge National Lab., Tenn.
THERMAL ANALYSIS OF CONICAL SHELLS, by F. J. Witt. 7 July 61, 28p.

PB 149 241 $2.60

Plastics Lab., Princeton U., N. J.
THERMODYNAMICS OF THE HYDROGEN SULFIDE-WATER SYSTEM RELEVANT TO THE DUAL TEMPERATURE PROCESS FOR THE PRODUCTION OF HEAVY WATER, by Herbert A. Pohl. Rept. on Contracts DA 36-039-sc-78105 and AT(07-2)-1. 1 July 60, 28p. 8 refs. Technical rept. no. 58B; AD-239 831.

DESCRIPTORS: *Heavy water, Preparation, *Thermodynamics, Water, Hydrogen compounds, Sulfides, Chemical equilibrium, Exchange reactions, Enthalpy, Chemical reactions.

A collation and evaluation of thermodynamic values for the liquid and gaseous phases of hydrogen sulfide-water mixtures, including the light and heavy hydrogen compounds is presented. The data were correlated and extended by reasonable interpolation or extrapolation generally for the temperature range 0° to 140°C and for pressures up to 300 psi. The data are intended for guidance in analysis of the dual temperature process for making heavy water. They have been particularly useful in examining the thermal feedback effects in that process, as a particular example of the behavior of counter-current process thermal effects. (Author)

PB 155 505 $2.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
MORSE POTENTIAL PARAMETERS FOR O-O, N-N, AND N-O, by Daniel D. Konowalow and Joseph O. Hirschfelder. Rept. on Contract DA 11-022-ORD-2526. 25 Oct 60, 21p. 24 refs. WIS-OOR-30, Series 5; OOR rept. 1898:13-C; AD-245 947; AD-247 330.

DESCRIPTORS: Temperature, *Thermodynamics, High temperature research, *Gas ionization, *Oxygen, *Nitrogen, *Atomic orbitals, Mathematical analysis, Atoms, Energy, Electrons, Nitrogen compounds, Oxides.

Morse potential parameters are determined for the atom-atom interactions corresponding to the following states having potential minima: the $X\,^3\Sigma_g^-$, $^1\Delta_g$, $^1\Sigma_g^+$, $^3\Delta_u$, $A\,^3\Sigma_u^+$, $^1\Sigma_u^-$, and $B\,^3\Sigma_u^-$ states of O-O (or molecular oxygen); the $X\,^1\Sigma_g^+$, $A\,^3\Sigma_u^+$, $B\,^3\pi_g$, $a\,^1\pi_g$, and $C\,^3\pi_u$ states of N-N (or molecular nitrogen); and the $X\,^2\pi_{1/2}$, $X\,^2\pi_{3/2}$, $B\,^2\pi$, $C\,^2\pi$, $D\,^2\Sigma^+$, $B'\,^2\Delta$, $E\,^2\Sigma^+$, and $A\,^2\Sigma^+$ states of N-O (or nitric oxide). For the nitric oxide excited A, D, and E $^2\Sigma^+$ states, a unique assignment of dissociation products and unique

energies of dissociation were obtained by supposing that these three states have the same shape for their potential energy curves. Our analysis suggests the possibility of an unobserved $^2\Sigma^+$ excited state of NO having a potential minimum 2454 cm^{-1} above the minimum for the $D^2\Sigma^+$ state. This new state should dissociate into a ground state nitrogen atom and a $(2s)^2(2p)^3(3p)$ ^{3} P oxygen atom. (Author)

PB 155 504 $3.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
VISCOSITY OF TWO COMPONENT GASEOUS MIXTURES, II. COMPARISON OF EXPERIMENT AND THEORY, by Reginald Rutherford, Marion H. Taylor, and Joseph O. Hirschfelder. Rept. on Contract DA 11-022-ORD-2526. 23 June 60, 33p. 31 refs. WIS-OOR-29a, Series 2 and 5; OOR rept. 1898:12-C; AD-247 331 AD-245 948

DESCRIPTORS: *Gases, *Viscosity, Mixtures, Theory, Diffusion, Tables, Temperature, Determination.

Tables are given for the following: (1) sixteen gas mixtures which show viscosity maxima; (2) 28 gas mixtures which do not exhibit viscosity maxima; and (3) comparison of experimental and theoretical values for alpha Kaptie experimental value being derived from the coefficient of binary diffusion and the viscosities of the pure gases at the temperature. (See also PB 150 411)

Wave Propagation

PB 154 178 $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A FERRITE-FILLED CYLINDRICAL CAVITY, by T. S. Chu and R. G. Kouyoumjian. Rept. on Antenna Phenomena Research, Contract DA 36-039-sc-70174 30 May 59, 27p. 15 refs. Rept. 662-31; AD-226 993.

DESCRIPTORS: *Waveguides, *Microwaves, *Resonance, Mathematical analysis, Propagation, *Ferrites, *Electromagnetic waves.

The modes in a ferrite-filled cylindrical waveguide were analyzed, and a characteristic equation given for their propagation constants in terms of the frequency and applied magnetic field. However, there have been no reported experimental confirmations of these solutions. It is convenient to carry out the experiment by measuring the related resonances in a ferrite-filled cylindrical cavity. This was done for the F_{ono} and F_{oni} modes in a symmetrically excited cavity. The measured resonant frequencies are in general agreement with numerical results based on the solution of the characteristic equation and the theories of Polder and Rado. Assuming that $\mu_z \simeq \mu$, the components of the tensor permeability below the magnetic saturation of the ferrite may be determined over a range of frequencies from the measured curves of resonance. This type of measurement avoids certain difficulties inherent with the perturbation method. The curves of resonance may be used to calculate the gyromagnetic ratio of the ferrite. (Author)

PB 157 740 $10.10

Dynatronics, Inc., Orlando, Fla.
TLM-18 ANTENNA CONVERSION. Final engineering rept. on Contract AF 08(606)3336. 16 Nov 59, 122p. 5 refs. AFMTC-TR-59-33; AD-232 168.

DESCRIPTORS: *Telemetering antennas, Antennas, *Aerial targets, Tracking, Design, Specifications, Military requirements

System design and component specifications are given for converting the existing TLM-18 telemetry and tracking antenna to enable the system to receive data and track moving targets radiating signals in the assigned 2200 to 2300 mc telemetry band. The system design represents an optimum technical approach which is compatible with economic feasibility. In addition to operation at the 216- to 260-mc telemetry band the 2200- to 2300-mc modification offers the following additional advantages: (a) increased frequency coverage, (b) increased range to the extent of narrow band planetary communications, (c) more accurate positional data in both low and high frequency modes of operation, and (d) ability of the system to operate continuously in wind speeds of at least 35 mph. Frequency conversion of the system will be simply accomplished by: (a) electrical switching, and (b) feed change. These 2 operations should be accomplished in approximately one hr.

PB 155 236 $2.60

Electronics Research Lab., U. of California, Berkeley.
SOLAR RADIATION AND ATMOSPHERE ABSORPTION FROM THE OZONE LINE AT 8.3 MM, by Robert Burneal Mouw and Samuel Silver. Rept. on Contract Nonr-222(54). 30 June 60, 27p. 9 refs. Space Sciences Lab. series no. 1, issue no. 1; IER series no. 60, issue no. 277; AD-245 039.

DESCRIPTORS: *Solar energy, Atmosphere, Absorption, Earth, *Electromagnetic waves, *Propagation, Ozone, Extremely high frequency, Radiometers.

The absorption of solar radiation by the earth's atmosphere was measured in the 8.3 mm wave length region using a paraboloidal antenna and a Dicke type of radiometer. The spectral region corresponds to one of the ozone lines. Series of measurements yield varying results of the dependence of the atmospheric absorption on frequency. A theoretical evaluation was made for an idealized distribution of ozone in the 8 mm region. Their integrated absorption is just at the threshold of sensitivity of our instrument and, therefore, the effects of the wings of the water and oxygen bands may be a significant factor in our observations. (Author)

PB 157 825 $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ANALYSIS OF CIRCULAR WAVEGUIDE MODES, by L. B. Felsen. Final rept. on Contract DA 36-039-sc-71235. 28 Aug 57, 35p. 6 refs. Rept. R-604-57; PIB-532; AD-204 782.

DESCRIPTORS: *Waveguides, Electromagnetic waves, Propagation, Scattering, Resonance, Mathematical analysis, *Wave transmission, Dielectrics, Theory.

The purpose of this work is the theoretical and experimental investigation of the behavior of mode fields in multimode circular waveguide, and of the interaction between modes in discontinuity regions.

PB 157 824 $2.60

Stanford Electronics Labs., Stanford U., Calif.
A RAPID-SCANNING PHASED ARRAY FOR PROPAGATION MEASUREMENTS, by R. E. Miller, A. T. Waterman, Jr. and others. Rept. on Contract DA 36-039-sc-73151. 30 July 58, 26p. 5 refs. Technical rept. no. 461-5; AD-202 859.

DESCRIPTORS: Radio waves, Propagation, Measurement, *Radar antennas, S-Band, *Antenna radiation patterns, *Helixes, *Radio beams, *Radar reflectors, Radar scanning, Design.

An S-band broadside antenna array is described in which each radiating element consists of a parabolic reflector which is fed by a helix radiator and local ground plane, so that the signal radiated (or susceptible of reception) is circularly polarized. Phase shifting is accomplished by mechanical rotation of each helix. If the various helices are rotated at multiple rates, the array then produces a beam which is narrow owing to the overall size of the array, and which swings rapidly, owing to the rapid rotation of individual helices. This report describes the pertinent design considerations, construction and measurements on such an antenna. The antenna has a principal-lobe half-power beamwidth of 0.5 degrees and is capable continuously of scanning a sector 4.2 degrees wide at a rate as high as 10 scans per second. This antenna is currently in operation at 3.12 kMc in connection with beyond-the-horizon propagation experiments to obtain data pertaining to propagation irregularities in the troposphere.

PB 154 471 $2.60

Stanford Electronics Labs., Stanford U., Calif.
SOME GENERALIZED SCATTERING RELATIONSHIPS IN TRANSHORIZON PROPAGATION, by A. T. Waterman, Jr. Rept. on Contract DA 36-039-sc-73151. 13 June 58, 30p. 21 refs. Technical rept. no. 461-4; AD-162 424.

DESCRIPTORS: *Microwaves, *Radio transmission, Scattering, Transmission, Meteorology, Atmosphere.

An analysis is made of the consequences to be derived from some fairly broad assumptions as to the nature of turbulent scattering and its effect on waves propagated through the troposphere. The intent is to provide a means for testing the general applicability of this model as an explanation for transhorizon propagation. General relationships for the variation of received power with distance are derived, for various scatter-angle dependencies and for various beam-width configurations. These relationships are then extended to cover the phenomenon of aperture-medium coupling loss. The results are applied toward distinguishing those experiments which are definitive from those which are not. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 171 006 $3.00 in limited quantity
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Army Research Office, Washington, D. C.
ARMY RESEARCH TASK SUMMARY, FISCAL YEAR 1960. VOLUME 7. INDEX, 20 Feb 61, 793p.

DESCRIPTORS: *Military research, Medical research, Psychology, Chemistry, Physics, Geophysics, Engineering, Materials, Mathematics, Operations research, *Indexes

Contents:
Sect. 1. Project numbers, contract and grant numbers, project titles, and task titles
Sect. 2. Location of work: Army installations, other government installations, roster of contractors doing external work
Sect. 3. Chief investigators
Sect. 4. Scientific fields and sub-fields
Sect. 5. Subject index
(See also PB 161 139)

PB 157 820 $7.60

[General] Applied Science Labs., Inc., Hempstead, N. Y.
METHODS FOR ANALYZING SHOCK AND VIBRATION, by Myron Kaufman. Final rept. 16 July 56-15 July 57, on Contract DA 36-039-sc-73022. [1957] 75p. 11 refs. Gruen rept. no. 1002-F; AD-156 633.

DESCRIPTORS: *Vibration, Spectrographic analysis, *Shock, *Experimental data, Fatigue (Mechanics), Failure (Mechanics), Magnetic recording systems, Statistical distributions, Test methods, Errors, Fourier analysis, Band-pass filters.

Portions of this report will not reproduce well.
(See also PB 156 297)

OTS SB-470 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
MACHINE TRANSLATIONS (SUPPLEMENT TO SB-439) Aug 61, 6p. 48 refs. OTS Selective Bibliography SB-470.

DESCRIPTORS: *Machine translation, Bibliography, Language, Programming, Computers, Documentation, Data storage systems, Reading machines, USSR

Lists reports added to the OTS collection during the period October 1960 to August 1961. Covers 48 references on domestic and foreign developments in machine translation theory, devices, programming, storage and retrieval of information. Contains reports on translation of Russian by machines, mechanical determination of syntactic function of words, survey of the state-of-art of mechanical translation of foreign languages by high speed electronic computers, etc.

PB 152 707 $6.60

Institute of Optics, U. of Rochester, N. Y.
METHOD OF EVALUATING IMAGES PRODUCED ON FILM BY PHOTOGRAPHIC OBJECTIVES, by R. E. Hopkins, J. A. Eyer and others. Final rept. 1 June 56-30 Sep 58, on Contract DA 36-039-sc-72400. 30 Sep 58, 63p. 26 refs. AD-211 956.

DESCRIPTORS: *Photographic lenses, *Optical images, Test methods, Test equipment, *Photographic film, Photographic emulsions, Optical systems, Mathematical analysis.

A general survey of the measurement and use of frequency response methods in image analysis and measurement is given. Special attention is given to the problem of the response of photographic emulsions and lens-emulsion combinations. Several examples of the response of different films are given and an application of the technique to a lens-film combination is described. (See also PB 142 701)

AD-260 765 repriced $1.50

Naval Ordnance Lab., White Oak, Md.
A HIGH-SPEED ELECTROMECHANICAL SHUTTER, by Paul A. Kendall. 15 June 61, 60p. 7 refs. NAVWEPS rept. 7362.

DESCRIPTORS: Thermal radiation, Control, Spectrographic analysis, Design, Recording devices, Gases, Mathematical analysis, Temperature, *High speed photography, *High speed cameras, *Spectrographic cameras, Camera shutters

An electromechanical shutter with submillisecond open time was designed and constructed for accurately controlling the recording period of a Bausch and Lomb medium quartz spectrograph. By mechanically harnessing the magnetic field set up by a high current surge through a small flattened wire, a slotted shutter located in front of the slit of a spectrograph is opened in about 15 microseconds after the shutter is triggered. The open time of the present shutter can be varied from 100 to 500 microseconds and its closing time is about 5 microseconds. The shutter plate can be easily modified so that the minimum open time and closing time are each about 1 microsecond. (Author)

A D INDEX

AD No.	Div.
261 500	1
261 501	9
261 503	20
261 504	30
261 505	12
261 506	25
261 508	10
261 509	22
261 510	30
261 511	30
261 512	30
261 513	30
261 514	25
261 516	8
261 517	25
261 518	25
261 519	25
261 520	25
261 521	25
261 522	8
261 528	17
261 529	2
261 530	4
261 531	10
261 532	25
261 533	2
261 534	17
261 539	9
261 540	10
261 541	27
261 542	25
261 544	9
261 546	5
261 547	9
261 548	10
261 549	14
261 550	14
261 551	16
261 552	16
261 553	28
261 554	16
261 555	16
261 556	16
261 557	16
261 559	17
261 561	26
261 562	26
261 563	26
261 564	26
261 565	2
261 566	13
261 567	1
261 570	25
261 571	28
261 572	25
261 577	8
261 580	25
261 582	16
261 583	5
261 584	2
261 585	25
261 586	30
261 587	14
261 588	25
261 589	10
261 591	32
261 592	30
261 593	26
261 594	7
261 600	8
261 601	8
261 605	28
261 607	19
261 608	16
261 611	17
261 612	17
261 614	16
261 616	25
261 619	30
261 620	18
261 621	18
261 622	18
261 623	30
261 624	30
261 625	30
261 626	30
261 641	4
261 642	27
261 644	16
261 645	7
261 646	7
261 647	7
261 648	7
261 652	16
261 653	8
261 655	25
261 656	25
261 657	15
261 658	15
261 659	15
261 660	8
261 661	25
261 662	25
261 663	25
261 664	25
261 665	25
261 666	25
261 667	25
261 668	25
261 669	25
261 670	12
261 672	8
261 673	25
261 676	22
261 677	22
261 678	6
261 679	25
261 684	28
261 691	29
261 692	1
261 699	9
261 700	9
261 701	25
261 702	12
261 703	15
261 704	2
261 705	2
261 706	2
261 707	4
261 709	6
261 710	30
261 711	30
261 713	2
261 714	25
261 719	25
261 720	2
261 727	4
261 728	4
261 729	4
261 730	8
261 731	25
261 732	25
261 734	8
261 735	7
261 736	8
261 737	2
261 738	10
261 739	16
261 740	9
261 741	30
261 742	10
261 743	8
261 744	31
261 745	6
261 746	1
261 747	25
261 748	4
261 749	28
261 753	27
261 755	8
261 756	16
261 757	16
261 758	16
261 761	8
261 762	25
261 763	8
261 764	6
261 765	8
261 767	9
261 768	17
261 769	2
261 770	25
261 771	25
261 772	17
261 773	25
261 774	25
261 776	14
261 777	8
261 778	17
261 779	26
261 780	27
261 781	22
261 782	22
261 783	22
261 784	2
261 785	25
261 786	1
261 787	2
261 788	12
261 789	13
261 790	17
261 791	17
261 792	17
261 793	17
261 794	17
261 795	17
261 796	5
261 797	20
261 798	25
261 799	2
261 800	8
261 801	8
261 802	25
261 803	17
261 804	14
261 805	16
261 806	2
261 807	9
261 808	17
261 809	17
261 810	25
261 811	8
261 812	25
261 813	9
261 814	25
261 815	8
261 816	1
261 817	30
261 818	25
261 819	25
261 820	25
261 821	17
261 822	12
261 823	12
261 824	1
261 825	12
261 826	12
261 827	9
261 828	32
261 829	20
261 830	25
261 831	17
261 832	25
261 833	25
261 834	2
261 835	2
261 837	22
261 838	2
261 839	4
261 840	8
261 841	7
261 842	2
261 843	2
261 845	2
261 846	9
261 847	8
261 849	25
261 850	18
261 851	30
261 852	15
261 853	15
261 855	20
261 856	8
261 857	20
261 858	25
261 860	4
261 861	8
261 862	2
261 863	2
261 864	2
261 865	2
261 866	25
261 867	30
261 868	25
261 873	30
261 876	8
261 878	25
261 882	17
261 883	17
261 884	8
261 885	6
261 888	15
261 889	8
261 890	8
261 891	8
261 892	8
261 893	14
261 894	14
261 895	15
261 896	25
261 897	25
261 898	25
261 899	8
261 900	8
261 901	25
261 902	30
261 903	20
261 904	15
261 905	7
261 906	16
261 907	20
261 910	4
261 913	1
261 914	15
261 915	15
261 916	13
261 917	8
261 918	8
261 919	15
261 920	25
261 921	4
261 922	25
261 923	8
261 924	8
261 927	15
261 928	25
261 929	15
261 930	25
261 931	15
261 933	20
261 935	9
261 936	8
261 937	2
261 938	8
261 941	26

AD No.	Div.
261 942	9
261 943	6
261 944	4
261 945	26
261 946	14
261 948	18
261 949	15
261 951	30
261 952	8
261 953	29
261 954	1
261 958	22
261 959	27
261 960	7
261 961	1
261 963	12
261 964	12
261 965	12
261 966	28
261 968	11
261 969	25
261 970	8
261 971	4
261 972	25
261 973	8
261 974	20
261 975	20
261 977	1
261 978	14
261 979	26
261 980	2
261 981	25
261 983	16
261 984	25
261 985	15
261 987	17
261 988	8
261 989	8
261 994	26
261 995	5
261 996	8
261 997	13
261 998	22
262 000	24
262 001	25
262 002	8
262 004	8
262 005	25
262 006	8
262 007	16
262 008	7
262 009	19
262 010	19
262 011	30
262 012	19
262 013	2
262 014	8
262 015	14
262 016	25
262 017	8
262 018	25
262 019	22
262 022	9
262 023	12
262 024	9
262 025	15
262 026	25
262 027	25
262 028	27
262 030	8
262 031	9
262 032	15
262 033	25
262 034	15
262 035	16
262 036	15
262 037	9
262 038	25
262 039	27
262 040	8
262 042	8
262 043	27
262 044	24
262 045	9
262 046	13
262 047	27
262 048	25
262 051	25
262 053	25
262 054	20
262 056	27
262 058	1
262 060	25
262 061	27
262 063	7
262 065	4
262 067	9
262 068	9
262 071	16
262 072	16
262 073	25
262 074	22
262 075	15
262 076	16
262 077	27
262 080	15
262 081	8
262 082	15
262 083	14
262 087	8
262 088	25
262 091	16
262 092	25
262 093	25
262 099	9
262 100	25
262 101	25
262 103	4
262 104	10
262 106	28
262 107	13
262 108	13
262 111	8
262 113	25
262 119	28
262 120	8
262 123	9
262 125	14
262 127	23
262 128	25
262 130	28
262 131	7
262 132	25
262 133	8
262 136	7
262 137	8
262 138	12
262 142	9
262 144	16
262 145	9
262 146	8
262 147	28
262 148	28
262 152	28
262 154	28
262 155	16
262 156	16
262 157	16
262 158	16
262 159	15
262 162	16
262 165	14
262 166	28
262 167	4
262 168	3
262 169	20
262 170	1
262 171	24
262 172	8
262 176	8
262 177	7
262 178	25
262 181	20
262 182	2
262 183	8
262 184	26
262 189	28
262 190	20
262 191	8
262 192	25
262 194	25
262 195	13
262 196	27
262 198	8
262 199	17
262 200	1
262 201	22
262 202	30
262 203	25
262 204	8
262 205	25
262 208	25
262 209	5
262 211	20
262 212	23
262 213	20
262 215	25
262 218	26
262 220	8
262 224	32
262 225	32
262 229	4
262 230	9
262 231	9
262 232	31
262 233	2
262 234	5
262 236	28
262 237	8
262 238	14
262 239	8
262 240	25
262 241	17
262 242	14
262 244	17
262 245	14
262 246	14
262 247	14
262 248	14
262 249	22
262 250	8
262 254	26
262 255	2
262 256	2
262 259	28
262 260	15
262 261	25
262 262	7
262 265	16
262 266	16
262 274	25
262 275	8
262 277	25
262 278	16
262 279	14
262 280	8
262 282	25
262 283	5
262 284	2
262 285	5
262 294	32
262 296	17
262 297	17
262 298	7
262 299	25

NUMBER INDEX

Number	Page
59GL140	S-38
59GL142	S-38
59GL143	S-38
59GL242	S-38
ACNP-6009	S-31
AD-65 029	S-8
AD-137 912	S-17
AD-142 542	S-12
AD-155 026	S-16
AD-156 255	S-10
AD-156 264 (military only)	S-24
AD-156 265	S-9
AD-156 633	S-49
AD-156 967	S-9
AD-157 359	S-11
AD-157 363	S-12
AD-157 587	S-14
AD-158 049	S-24
AD-159 861	S-43
AD-159 981	S-10
AD-160 027	S-14
AD-160 082	S-24
AD-160 479	S-6
AD-161 873	S-17
AD-162 424	S-49
AD-200 359	S-46
AD-202 730	S-11
AD-202 859	S-49
AD-202 892	S-11
AD-204 618	S-15
AD-204 782	S-48
AD-208 070	S-13
AD-208 241	S-19
AD-208 654	S-13
AD-209 067	S-3
AD-209 447	S-44
AD-211 184	S-16
AD-211 644	S-15
AD-211 956	S-50
AD-211 799	S-20
AD-212 027	S-13
AD-213 571	S-19
AD-214 041	S-15
AD-215 399	S-15
AD-216 202	S-18
AD-216 414	S-9
AD-217 536	S-10
AD-218 077	S-9
AD-218 854	S-19
AD-220 306	S-9
AD-225 864	S-24
AD-226 515	S-14
AD-226 993	S-8
AD-227 614	S-18
AD-227 783	S-13
AD-229 265	S-5
AD-229 854	S-32
AD-230 079	S-12
AD-230 159	S-12
AD-230 516	S-21
AD-230 659	S-43
AD-230 693	S-18
AD-231 109	S-46
AD-231 172	S-23
AD-231 173	S-47
AD-231 221	S-20
AD-232 168	S-48
AD-232 232	S-18
AD-232 955	S-27
AD-233 001	S-16
AD-233 046	S-29
AD-233 665	S-5
AD-234 425	S-17
AD-234 427	S-5
AD-234 954	S-5
AD-235 250	S-27
AD-236 465	S-25
AD-236 498	S-32
AD-238 249	S-45
AD-238 615	S-10
AD-239 831	S-47
AD-242 774	S-20
AD-243 443	S-17
AD-244 923	S-6
AD-244 950	S-29
AD-245 039	S-48
AD-245 332	S-26
AD-245 676	S-8
AD-245 846	S-8
AD-245 947	S-47
AD-245 948	S-48
AD-246 895	S-42
AD-247 330	S-47
AD-247 331	S-48
AD-247 384	S-1
AD-247 465	S-44
AD-247 660	S-8
AD-248 589	S-45
AD-248 931	S-20
AD-249 952	S-2
AD-249 731	S-43
AD-250 108	S-48
AD-250 805	S-22
AD-251 136	S-14
AD-251 211	S-31
AD-251 526	S-26
AD-251 525	S-31
AD-251 776	S-43
AD-251 777	S-44
AD-251 837	S-2
AD-251 936	S-3
AD-252 097	S-7
AD-252 251	S-2
AD-252 252	S-3
AD-252 253	S-2
AD-252 092	S-3
AD-252 606	S-25
AD-252 671	S-44
AD-252 940	S-40
AD-252 964	S-42
AD-253 013	S-2
AD-253 044	S-28
AD-253 201	S-7
AD-253 202	S-3
AD-253 948	S-30
AD-254 653	S-29
AD-254 818	S-1
AD-254 819	S-1
AD-254 820	S-1
AD-254 847	S-7
AD-255 055	S-6
AD-255 723 repriced	S-22
AD-256 413	S-11
AD-256 716	S-15
AD-256 900	S-22
AD-257 582	S-16
AD-257 736	S-11
AD-258 261	S-17
AD-258 612	S-42
AD-259 507 repriced	S-6
AD-260 252 repriced	S-25
AD-260 765 repriced	S-50
AD-260 894 repriced	S-23
AEPG MMRN-1	S-6
AEPG-SIG-970-30	S-6
AFCCDD-TR-60-39	S-1
AFMTC-TR-59-33	S-48
AFOSR-70	S-28
AFOSR-TN-58-217	S-5
AFOSR-TN-58-1044	S-47
AFOSR-TN-59-728	S-29
AFOSR-TN-59-1002	S-23
AFOSR-TN-59-1165	S-27
AFOSR-TN-60-27	S-16
AFOSR-TR-60-34	S-5
AGN-TM-392	S-26
AIR-B98-61-FR-253(1)	S-1
AIR-B98-61-FR-253(2)	S-1
AIR-B98-61-FR-253(3)	S-1
Airtron-R11-105	S-9
ALI C-60628	S-15
AMF Atomics ER-7558	S-32
ANL-6257	S-5
ANL-6333	S-32
ANL-6399	S-35
APAE-88	S-35
APDA-141	S-26
APDA-143	S-35
APEX-475(Del.)	S-30
ARF-1184-1	S-44
ARF-3187-4	S-33
AROD-1898: 12-C	S-48
ARPA Order-120-60	S-22
ARPA Order-120-60	S-42
ASRDL E-1218	S-9
ASRDL M-1797	S-10
ASRDL M-1897	S-24
ASRDL M-1919	S-10
ASRDL M-1939	S-24
ASRDL M-1942	S-10
ASRL-TR-90-1	S-7
ATL-D-619	S-35
BAW-1186	S-36
BAW-1206	S-36
BMI-1532	S-31
BMI-1533	S-5
BMI-X-165	S-36
BMI-X-169	S-30
BNL-664(T-218)	S-33
BNL-5390	S-33
BNL-5391	S-44
BNL-5392	S-40
BNL-5492	S-34
BNL-5497	S-33
BNL-5530	S-36
BNL-5531	S-41
BNL-5532	S-36
BRL-1122	S-27
C-130	S-32
CF-59-3-94 (Rev. 2)	
(deleted)	S-5
CF-60-6-30	S-33
CF-60-11-39	S-35
CF-61-2-58	S-39
CF-61-3-39	S-41
CF-61-4-97	S-39
CF-61-5-2	S-38
CF-61-5-33	S-38
CF-61-5-67	S-40
CF-61-5-80	S-47
CF-61-5-90	S-23
CF-61-5-109	S-24
CF-61-5-118	S-33
CF-61-6-59	S-27
CU-17-60-SC-72831-CE	S-45
DA 36-039-sc-73059, FR	S-15
DLCS-1290103	S-35
DLCS-1470102	S-37
DLCS-1470104	S-37
DLCS-1490208	S-37
DLCS-1560105	S-37
DLCS-1560106	S-37
DLCS-1560303	S-37
DLCS-1580202	S-37
DLCS-2340106	S-40
DLCS-2390201	S-41
DLCS-3070102	S-37
DLCS-3180101	S-41
DLCS-3350101	S-34
DLCS-3350201	S-34
DLCS-3420101	S-34
DLCS-3480101	S-34
DLCS-3490102	S-37
DLCS-3500101	S-37
DLCS-3500201	S-37
DLCS-3550301	S-37
DLCS-3550501	S-37
DLCS-3560101	S-41
DLCS-3560102	S-40
DLCS-3560103	S-40
DLCS-3560104	S-40
DP-572	S-5
DP-597	S-42
DP-599	S-36
EP-130	S-7
EP-142	S-7
EP-144	S-3
EP-145	S-3
EP-146	S-3
EPL TR-42	S-14
GA-1982	S-38
GA-2268	S-25
GAMD-1037	S-30
GAMD-2024	S-37
GAMD-2071, Cat. A.	S-37
GAMD-2124, Cat. A.	S-37
GASL-1002-F	S-49
GEAP-3486	S-39
GEAP-3717	S-38
GEAP-3737	S-38
GNE-60-1	S-32
HH-60-88	S-28
HW-61594	S-8
HW-62111	S-23
HW-63266	S-24
HW-65806(Pt. 1)	S-41
HW-67305	S-35
HW-67574	S-4
HW-67677	S-30
HW-67772	S-4
HW-68389	S-41
HW-68405	S-38
HW-68494	S-33
HW-68862	S-27
HW-68919	S-41
HW-69475	S-33
HW-SA-1957	S-4
HW-SA-1962	S-23
HW-SA-2179	S-31
IDO-14552	S-5
IDO-16624	S-39
IDO-16657	S-34
IER-60-277	S-48
IS-302	S-35
IS-305	S-41
IS-309	S-35
IST-2900-239-T	S-14
IST-2900-248-R	S-44
IST-2900-250-T	S-43
IST-2900-251-T	S-44
K-1483	S-39
KAPL-2143	S-47
KAPL-M-EJC-6	S-30
KAPL-M-HP-8	S-35
KAPL-M-MAG-5	S-30
KAPL-M-MAK-1	S-27
KAPL-M-RJR-4	S-42
KAPL-M-SLJ-1	S-4
KAPL-M-WBL-3	S-27
LA-1468	S-4
LA-2560	S-34
LAMS-2496	S-31
LAMS-2474	S-38
LAMS-2526	S-4
LAMS-2551	S-26
LAMS-2561	S-38
LAMS-2574	S-40
LCT-2	S-36
LCT-3	S-41
MATT-71	S-47
MCW-1467	S-33
MIL-D-51030(CmlC) (PB 157 828)	S-25
MIL-D-51030A	S-25
ML-502	S-46
MND-P-3014-II	S-33
MSEE*58-26	S-16
MSEE-61-16	S-16
MURA-612	S-40
MURA-619	S-38
MURA-623	S-38
NAA-SR-5398	S-35
NAA-SR-5608	S-34
NAA-SR-5858	S-36
NAA-SR-5926	S-31
NAA-SR-5928	S-31
NAA-SR-6003	S-44
NAA-SR-6104	S-34
NAA-SR-6244	S-35
NAA-SR-M-2333	S-36
NAA-SR-M-2568	S-35
NAA-SR-M-2917	S-23
NAA-SR-M-4437	S-27
NAA-SR-M-4565 (Rev. 1)	S-36
NAA-SR-M-5230	S-27
NAA-SR-M-5869	S-30
NAA-SR-M-5921	S-29
NAA-SR-M-5933	S-29
NAA-SR-M-5951	S-24
NAA-SR-M-5952	S-29
NAA-SR-M-6006	S-23
NAA-SR-M-6045	S-39
NAA-SR-M-6064	S-4
NAA-SR-M-6082	S-36
NAA-SR-M-6103	S-36
NAA-SR-M-6128	S-36
NAA-SR-M-6214	S-36
NAA-SR-M-6228	S-33
NAA-SR-M-6233	S-39
NAA-SR-M-6261	S-35
NAA-SR-M-6268	S-39
NAA-SR-M-6298	S-23

Number	Page
NAS-NS-3038	S-33
NAVWEPS-7335	S-6
NAVWEPS-7354	S-22
NAVWEPS-7362	S-50
NAVWEPS-7379	S-25
NBS TN-106	S-1
NMI-7200	S-30
NMI-7203	S-30
NMI-7207	S-30
NMI-7208	S-30
NMI-7209	S-30
NMI-7238	S-38
NRCC-6349	S-42
NRCC MT-43	S-42
NYO-2578	S-8
NYO-2579	S-32
NYO-2579 (suppl.)	S-32
NYO-2582	S-32
NYO-2691	S-39
NYO-2962	S-40
NYO-4688	S-5
NYO-7834	S-41
NYO-9118	S-41
NYO-9142	S-33
NYO-9403	S-33
NYO-9579	S-33
NYO-9633	S-4
NYO-9688	S-33
NYO-9745	S-26
NYO-9746	S-40
NYO-9834	S-25
ORD M 7-227	S-21
OORR-1898:13-C	S-47
ORNL-3070	S-39
ORO-369	S-40
ORO-417	S-33
OSURF-662-14	S-9
OSURF-662-31	S-8
OSURF-662-22	S-9
OSURF-824	S-27
OTS SB-439, suppl.	S-49
OTS SB-470	S-49
PA TR-1125	S-22
Pace 31R	S-6
Parsons-1026-F1	S-8
PB 146 912	S-25
PB 148 350	S-45
PB 149 241	S-47
PB 150 905	S-3
PB 150 907	S-18
PB 152 080	S-11
PB 152 083	S-19
PB 152 084	S-44
PB 152 308	S-43
PB 152 507	S-19
PB 152 508	S-16
PB 152 511	S-15
PB 152 593	S-14
PB 152 594	S-13
PB 152 666	S-15
PB 152 707	S-50
PB 152 708	S-18
PB 152 710	S-9
PB 152 711	S-24
PB 152 712	S-10
PB 153 048	S-20
PB 153 049	S-13
PB 153 423	S-1
PB 153 868	S-15
PB 153 869	S-24
PB 153 982	S-31
PB 153 983	S-26
PB 153 984	S-31
PB 154 175	S-12
PB 154 176	S-9
PB 154 177	S-9
PB 154 178	S-48
PB 154 179	S-9
PB 154 191	S-10
PB 154 201	S-20
PB 154 257	S-43
PB 154 319	S-8
PB 154 433	S-7
PB 154 471	S-49
PB 154 497	S-13
PB 154 500	S-42
PB 154 512	S-7
PB 154 513	S-3
PB 154 514	S-3
PB 154 520	S-19
PB 154 547	S-25
PB 154 548	S-3
PB 154 822	S-29
PB 154 833	S-14
PB 154 849	S-40
PB 154 855	S-11
PB 154 856	S-17
PB 154 911	S-23
PB 154 973	S-11
PB 154 975	S-5
PB 155 005	S-30
PB 155 015	S-17
PB 155 044	S-43
PB 155 045	S-44
PB 155 048 See PB 154 512	S-7
PB 155 050 See PB 154 513	S-3
PB 155 051 See PB 154 514	S-3
PB 155 183	S-44
PB 155 197 See PB 154 547	S-25
PB 155 234	S-28
PB 155 236	S-48
PB 155 315	S-42
PB 155 318	S-28
PB 155 330	S-45
PB 155 331	S-10
PB 155 364 See PB 154 433	S-7
PB 155 365 See PB 154 548	S-3
PB 155 504	S-48
PB 155 505	S-47
PB 155 549	S-28
PB 155 558	S-46
PB 155 561	S-14
PB 155 563	S-13
PB 155 733	S-17
PB 155 735	S-22
PB 155 741	S-20
PB 156 763 See AD-258 612	S-42
PB 155 887	S-21
PB 155 952	S-7
PB 156 568	S-3
PB 156 569	S-2
PB 156 570	S-2
PB 156 571	S-2
PB 156 572	S-2
PB 156 573	S-2
PB 156 772	S-23
PB 156 820	S-26
PB 156 822	S-29
PB 156 823	S-6
PB 156 825	S-8
PB 156 826	S-8
PB 156 837	S-44
PB 156 913	S-24
PB 157 266	S-8
PB 157 712	S-5
PB 157 713	S-45
PB 157 714	S-27
PB 157 719	S-46
PB 157 720	S-23
PB 157 721	S-18
PB 157 724	S-32
PB 157 725	S-12
PB 157 727	S-21
PB 157 728	S-16
PB 157 729	S-10
PB 157 730	S-47
PB 157 731	S-18
PB 157 732	S-29
PB 157 734	S-12
PB 157 736	S-16
PB 157 739	S-17
PB 157 740	S-48
PB 157 741	S-27
PB 157 745	S-15
PB 157 746	S-5
PB 157 747	S-12
PB 157 765 See AD-257 582	S-16
PB 157 766 See AD-257 736	S-11
PB 157 771 See AD-256 716	S-15
PB 157 774 See AD-256 900	S-22
PB 157 777 See AD-258 261	S-17
PB 157 781 See AD-256 413	S-11
PB 157 820	S-49
PB 157 821	S-20
PB 157 822	S-43
PB 157 823	S-6
PB 157 824	S-49
PB 157 825	S-48
PB 157 826	S-10
PB 157 827	S-14
PB 157 828	S-25
PB 157 950	S-21
PB 157 951	S-32
PB 157 971	S-9
PB 157 972	S-22
PB 157 124-1	S-1
PB 158 124-2	S-1
PB 158 124-3	S-1
PB 161 607	S-1
PB 171 006	S-49
PB 171 809	S-21
PB 171 809-1	S-21
Philips Case 13-126	S-17
Philips TR-128	S-17
PIB-532	S-48
PIB-536	S-16
PIB-594	S-15
PIB-703	S-16
PIBMRI-604-57	S-48
PIBMRI-608-57	S-16
PIBMRI-666-58	S-15
PIBMRI-775-59	S-16
PLPR-57B	S-25
PLPR-57C	S-45
PLPR-588	S-47
Project 5177	S-21
Project 6889	S-21
PU AEL-445	S-47
PU AEL-471	S-29
PU AEL-482	S-23
PU AEL-485	S-27
RADC-TN-59-15	S-3
RADC-TN-59-307	S-43
RADC-TR-59-153	S-12
RADC-TR-59-154	S-18
RADC-TR-59-187	S-12
RADC-TR-59-198	S-32
RADC-TR-59-203	S-46
RADC-TR-59-209	S-21
RADC-TR-59-216	S-18
RADC-TR-59-226	S-20
RADC-TR-60-30	S-17
RADC-TR-60-32	S-27
RCA SC-R2-59	S-18
RCA SC R-3-59	S-18
SCR-292	S-24
SCR-405	S-27
SCR-406	S-23
SCTM-62-61(14)	S-19
SCTM-94-61(24)	S-27
SCTM-115-61(25)	S-24
SCTM-146-61(13)	S-29
SCTM-166-59(52)	S-19
SCTM-280-60(51)	S-28
SCTM-297-58(14)	S-19
SEL TR-461-4	S-49
SEL TR-461-5	S-49
SEL YD-56-4-6	S-20
SL-1	S-32
SM-1	S-32
Squid JHU-18-T-R-P	S-48
Squid MIT-23-P	S-6
Squid SRI-8-P	S-29
SRO-49	S-39
SSL-1-1	S-48
TAR-TR-601	S-8
TAR-TR-602	S-8
TID-3043 (Rev. 1) (Suppl. 2)	S-1
TID-3077	S-41
TID-3565	S-4
TID-5402(Del)	S-36
TID-7015(Suppl. 3)	S-5
TID-7611	S-38
TID-11628	S-39
TID-11807	S-40
TID-11942	S-37
TID-12605	S-39
TID-12830	S-4
TID-12831	S-31
TID-12834	S-42
TID-12848	S-5
TID-12854	S-28
TID-12861	S-30
TID-12891	S-5
TID-12985	S-5
TID-13044	S-40
TID-13052	S-4
TID-13127	S-41
TID-13224	S-5
TII-8-39405-8	S-20
TREC-61-19	S-7
TREC-61-34	S-28
TSR-115	S-25
TT-195 ( )/FG	S-15
UCLA-477	S-4
UCLA-478	S-4
UCLA-6232-T	S-46
UCLA-6379	S-36
UCLA-6380	S-46
UCRL-6381	S-46
UCRL-6383	S-46
UCRL-6384	S-46
UCRL-6390	S-46
UCRL-6393	S-46
UCRL-6424	S-47
UCRL-6443	S-34
UCRL-6445	S-22
UCRL-8764	S-5
UCRL-9469	S-6
UCRL-9614	S-41
UCRL-9652	S-33
UCRL-9712	S-34
UCRL-9723	S-5
UCRL-9734	S-34
UCRL-13000	S-7
UCRL-13001	S-27
UMRI-1912-4-F	S-44
UMRI-2275-2-8-T	S-43
UMRI-2659-11-T	S-1
UMRI-2750-11-T	S-12
UMRI-2750-13-T	S-12
UMRI-2764-5-T	S-42
UMRI-2764-6-T	S-22
UR-594	S-35
USL-490	S-43
USL-495	S-42
WADD-TN-60-126	S-2
WADD-TN-60-214	S-3
WADD-TN-60-219	S-2
WADD-TN-60-257	S-2
WADD-TN-60-262	S-2
WADD-TN-60-264	S-2
WADD-TR-60-368	S-8
WAL-143/36	S-31
WAL-315.23/1	S-30
WAL-810.2/1	S-26
WAL-819.3/1	S-40
WAL-830.3/2	S-31
WAL-836.32/3	S-29
WAPD-PWR-TE-67(Del)	S-36
WAPD-T-1205	S-26
WAPD-TM-230	S-26
WAPD-TM-284	S-34
WCAP-4054	S-39
WCAP-4055	S-39
WIS-OOR-29a, Ser. 2 and 5	S-48
WIS-OOR-30, Ser. 5	S-47

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- Establishing a new business

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- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
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- Government-owned patents for free license
- Commodity standards

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- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
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